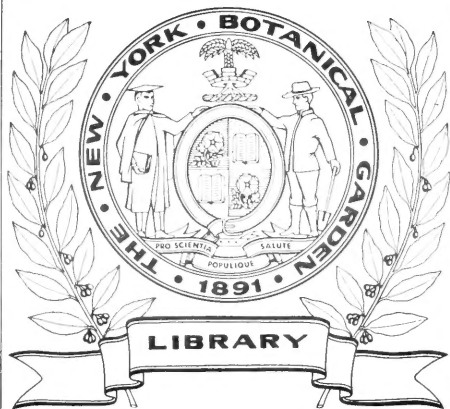
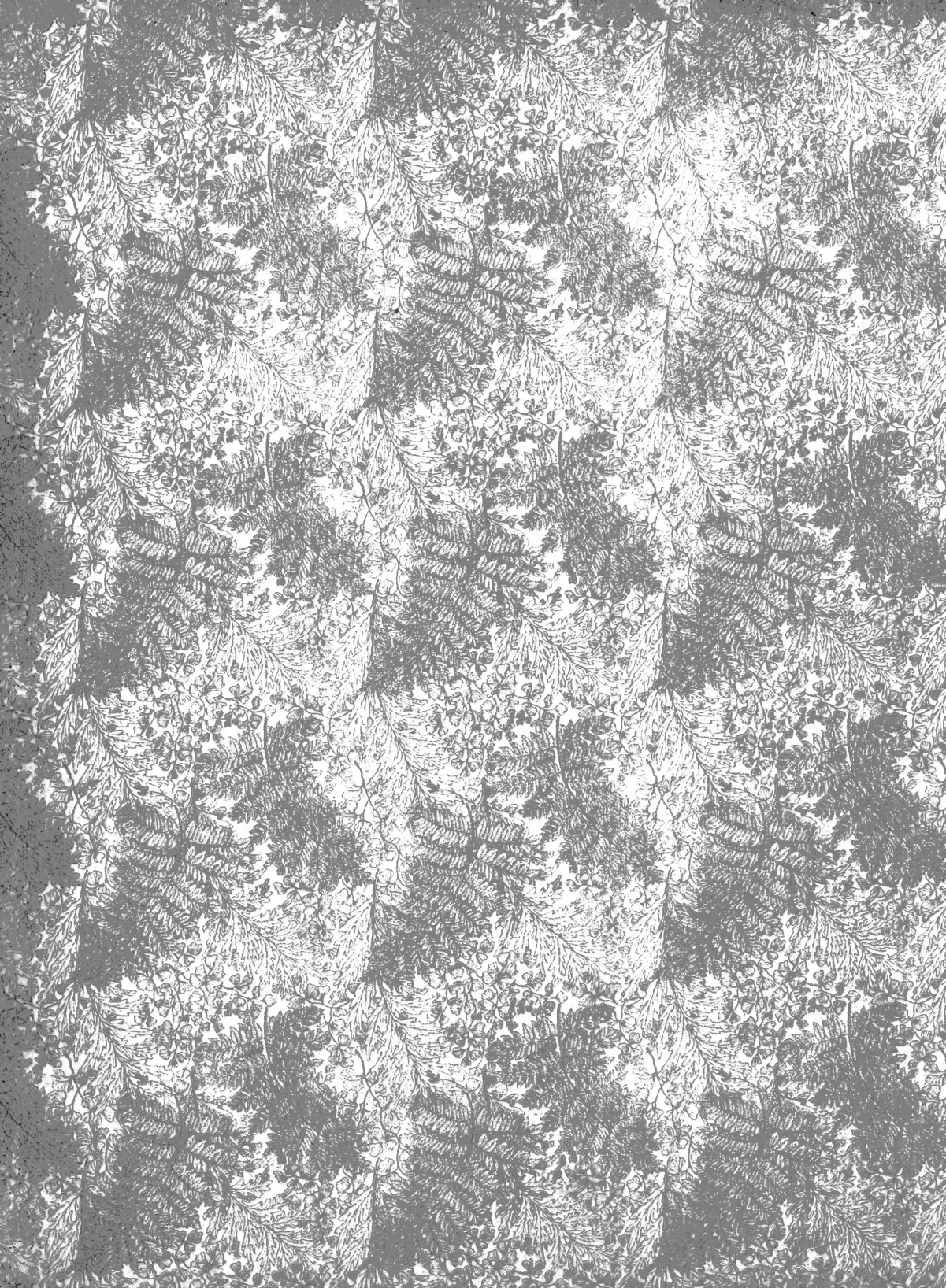
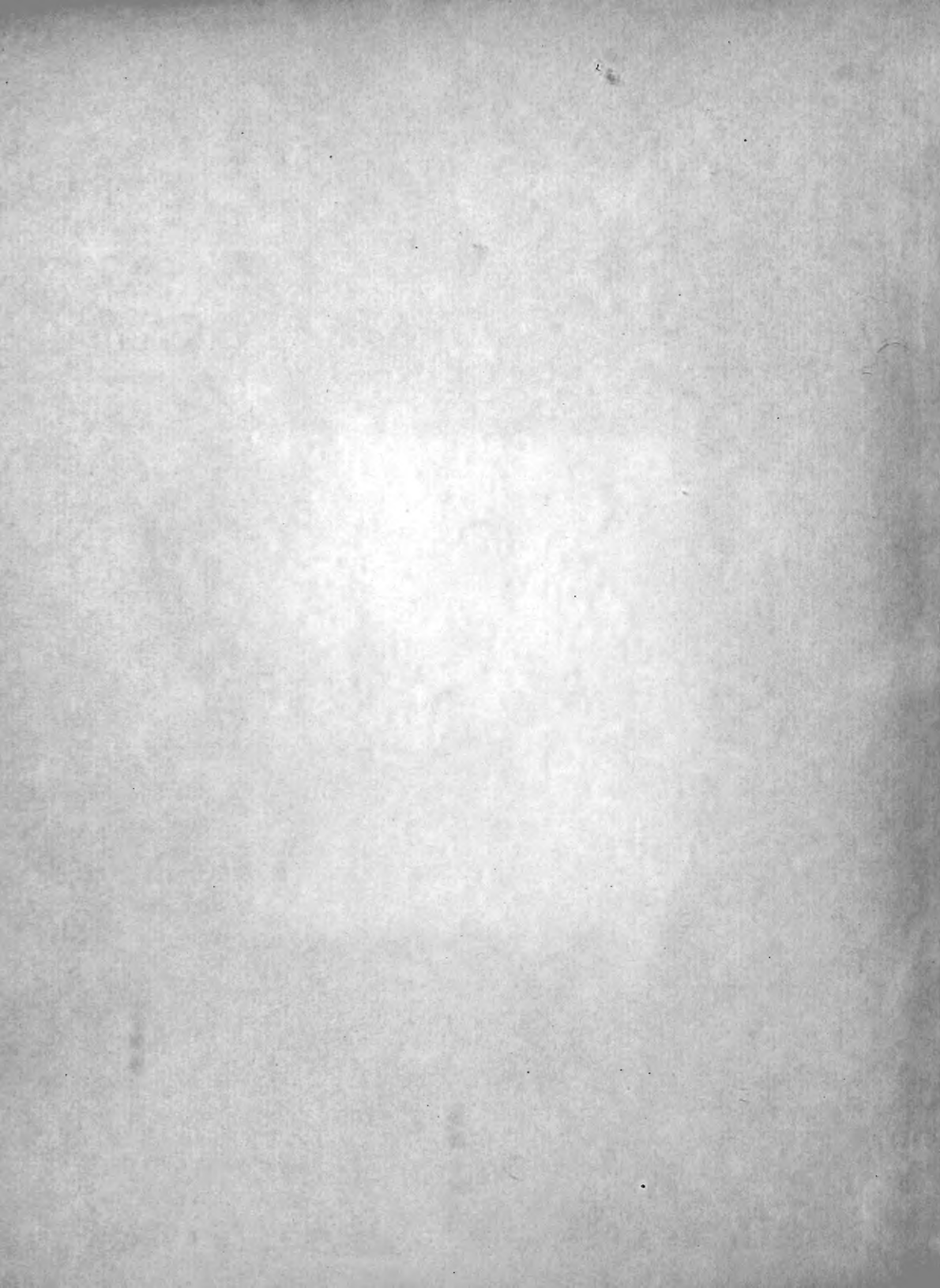




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ILLUSTRATIONS
OF THE
NEW ZEALAND FLORA.

EDITED BY
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ARXO, V. 1, 1944

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GAULTHERIA PERPLEXA, *T. Kirk.*

West, Newman imp.

PLATE 122.—GAULTHERIA PERPLEXA.

FAMILY ERICACEÆ.]

[GENUS GAULTHERIA, KAHN.

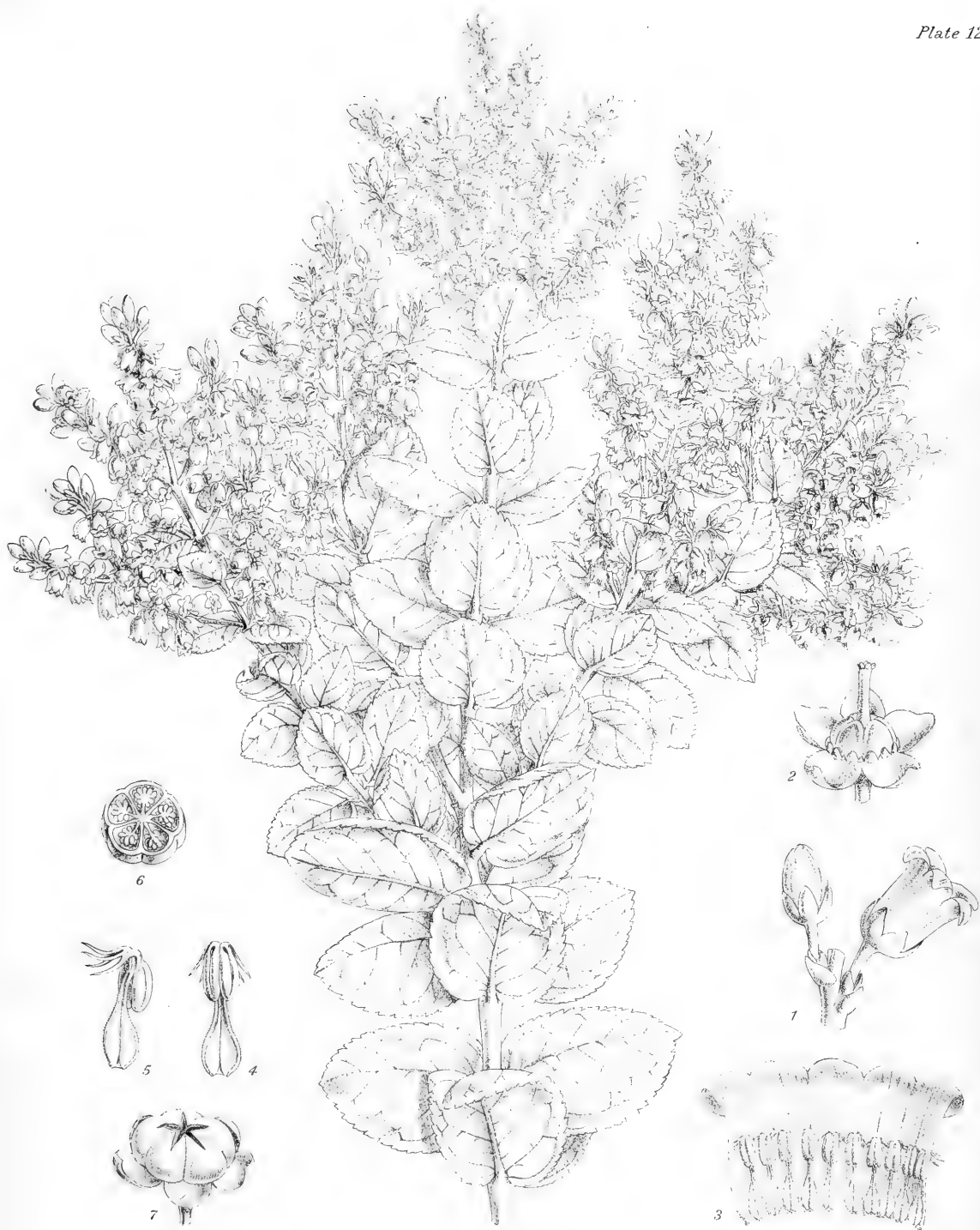
Gaultheria perplexa, T. Kirk in *Trans. N.Z. Inst.* xxix (1897), 538; *Cheesem. Man. N.Z. Fl.* 406.

Gaultheria perplexa is an exceedingly puzzling plant. From a physiognomic point of view it is very different from any of the varieties of *G. antipoda*, but at the same time it is not easy to find any floral or carpological characters in which the two plants do not agree. Hence Sir J. D. Hooker, in the "Flora Novæ Zelandiæ," treated it as a variety of *G. antipoda*, his reference to it being simply "var. *ciliata*: foliis parvis coriaceis lanceolatis serratis, dentibus setigeris." On the whole, we must regard it as a somewhat critical species, only to be separated from *G. antipoda* by the long and flexuous much and closely interlaced branches, and by the small and narrow leaves, the teeth of which are bristle-pointed.

So far as I am aware, *G. perplexa* was first collected by Mr. Colenso in 1847 on the elevated plateau to the east of Ngauruhoe and Ruapehu. It has since been gathered in many localities both in the North and South Island, and must be regarded as of fairly common occurrence in mountain districts from Lake Taupo southwards to Stewart Island, where it attains its southern limit. According to Mr. Aston, it ascends to 5,000 ft. on the Kaimanawa Mountains; while on the central volcanic plateau of the North Island it is usually seen between 2,000 ft. and 4,000 ft. In not a few localities in the South Island it descends to sea-level; Mr. Townson, for instance, finding it not uncommon on sand-dunes between Westport and Charleston; and Mr. Kirk near the entrance to the Bluff Harbour and on Stewart Island.

G. perplexa has a wide range of habitats. Its occurrence on fixed sand-dunes has just been mentioned, and it has also been recorded from peaty heaths so moist as almost to deserve the name of bogs (Cockayne, "Report on Stewart Island," 27). Inland, however, its usual habitat is in stony river-valleys, where it is generally mixed with *Discaria*, *Coprosma*, &c., a particularly favourite station being where an old shingle-fan almost overgrown with shrubby vegetation impinges upon the valley; or, as at the base of Ruapehu, it may be seen in scattered patches amongst the covering of *Danthonia Raoultii* and *Poa cæspitosa* so widely spread in subalpine districts.

PLATE 122. *Gaultheria perplexa*, drawn from specimens collected in the Buller Valley, Nelson, at an altitude of 1,200 ft. Fig. 1, leaf and flower ($\times 4$); 2, flower, with the corolla and part of the calyx removed ($\times 6$); 3, longitudinal section of corolla, showing the stamens ($\times 5$); 4 and 5, stamens ($\times 10$); 6, transverse section of ovary ($\times 8$); 7, ripe fruit ($\times 2$); 8, seed (enlarged); 9, embryo (enlarged).



M. Smith del.
J. N. Pritch lith.

GAULTHERIA OPPOSITIFOLIA, Hook. f.

West, Newman imp.

PLATE 123.—GAULTHERIA OPPOSITIFOLIA.

FAMILY ERICACEÆ.]

[GENUS GAULTHERIA, KAHN.

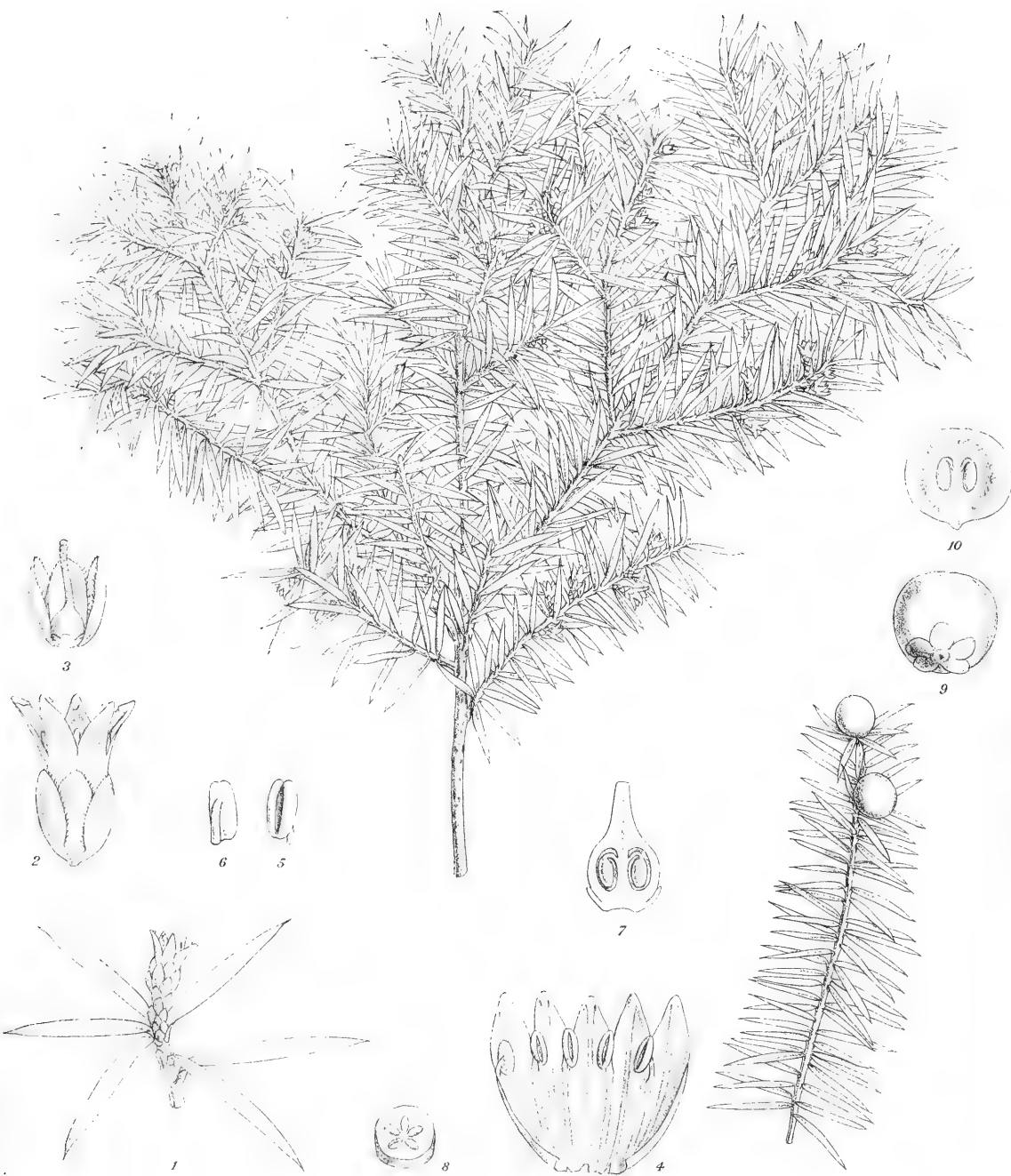
Gaultheria oppositifolia, Hook. f. *Fl. Nov. Zel.* i, 162, t. 43; *Cheesem. Man. N.Z. Fl.* 407.

I believe that this handsome plant was first collected by Mr. J. C. Bidwill in the interior of the North Island in 1839. The exact locality I am not acquainted with; but in all probability it was somewhere in the vicinity of Lake Taupo, where it is known to occur on cliffs and steep declivities. In the following year it was gathered by Dr. Dieffenbach, and in 1847 Mr. Colenso obtained specimens from a cliff overhanging a stream near Tarawera, between Napier and Taupo. He says ("Journeys to the Ruahine Range," 34), "Strange to say, I have never found another plant of this species, although from its size, large green leaves, and unique appearance it is not easily overlooked. In subsequent years in passing this way I often obtained good specimens from it." With our present knowledge of the distribution of the species this statement is somewhat unexpected. In 1853 Sir J. D. Hooker described the species in the "Flora Novæ Zelandiæ" under the name it still bears.

G. oppositifolia is usually (but not invariably) found on the faces of cliffs overhanging water, or on steep rocky slopes. The most northern localities known to me are the banks of the Upper Thames River, between Okoroire and Matamata, and on cliffs fringing the Waikato River a few miles below Cambridge. From these two stations it extends along the Waikato to Lake Taupo, and by way of the Patetere Plateau to Rotorua, where it is abundant. Mr. T. Kirk gathered it at an elevation of 3,200 ft. on Mount Tarawera, but in that locality it was destroyed by the eruption of 1886. I have collected it on Mount Kakaramaea (near Waiotapu) and on the Paeroa Range, and abundantly on the Karangahake Cliffs, on the western side of Lake Taupo. Mr. Field and others have observed it in the Wanganui district, which is the most western locality of which I have any certain knowledge, for although it is recorded in the "Handbook" from Mount Egmont no recent botanist has seen it thereon. Both Mr. Buchanan and myself searched for it in vain. Its extreme eastern locality is in the East Cape district, where many years ago Bishop Williams gathered it between Whangaparaoa and Hicks Bay.

G. oppositifolia is readily distinguished from the other New Zealand species of the genus by the large opposite leaves, which are sessile and cordate at the base, and by the racemes usually forming broad terminal panicles. It is easy of cultivation, and if the branches are judiciously cut back after the flowering season it forms a compact shrub presenting a handsome appearance when the next season comes round.

PLATE 123. *Gaultheria oppositifolia*, drawn from specimens collected at Waiotapu, between Rotorua and Taupo. Fig. 1, expanded flower and bud ($\times 4$); 2, flower, with the corolla and stamens removed ($\times 6$); 3, corolla laid open ($\times 6$); 4 and 5, front and back view of anthers ($\times 9$); 6, transverse section of ovary ($\times 6$); 7, fruit ($\times 6$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

CYATHODES ACEROSA. R. Br.

PLATE 124.—CYATHODES ACEROSA.

FAMILY EPACRIDACEÆ.]

[GENUS CYATHODES, LABILL.

Cyathodes acerosa, R. Br. Prodr. 539; Hook. f. Fl. Nov. Zel. i. 163; Cheesem. Man. N.Z. Fl. 411.

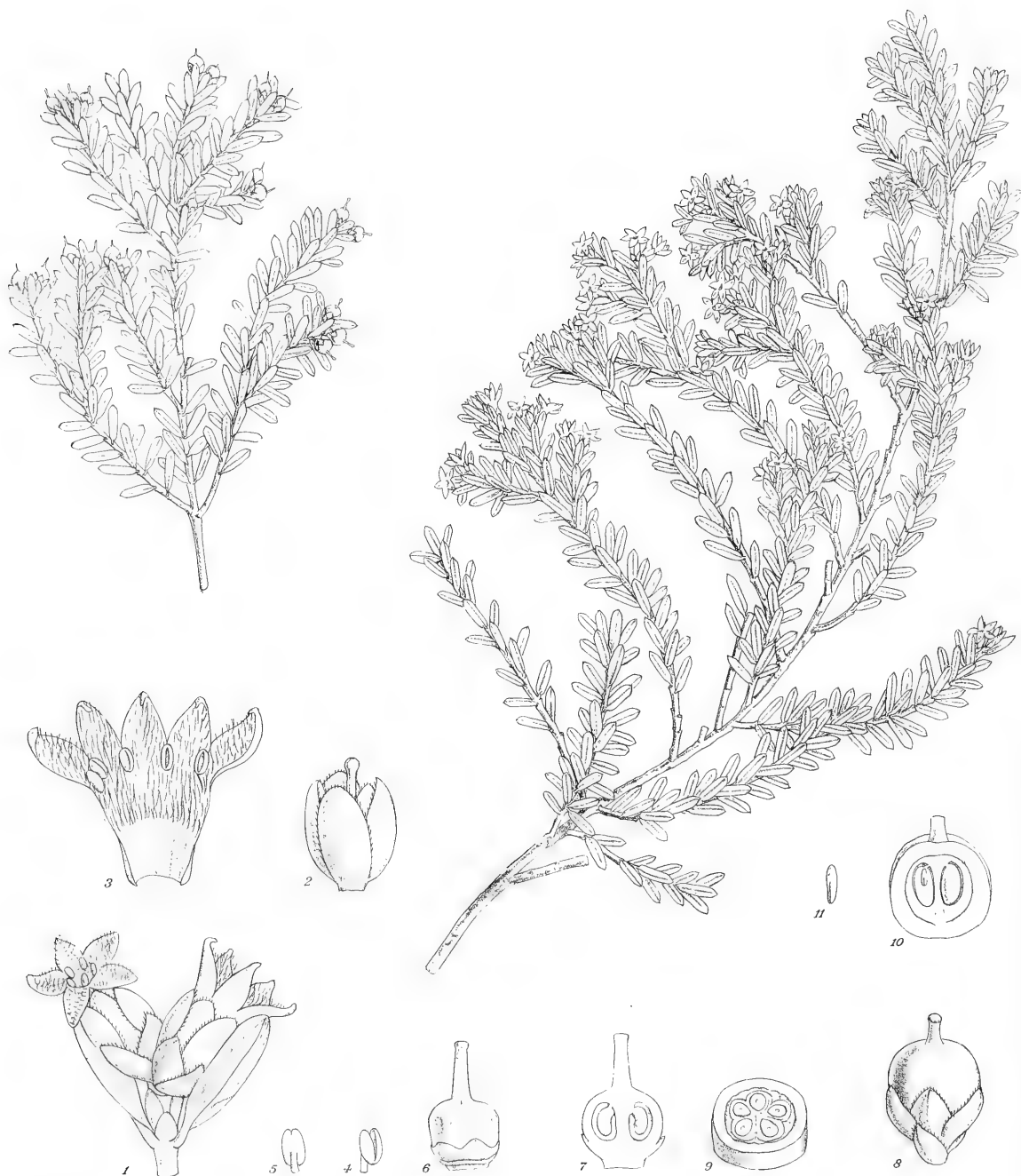
The subject of this plate was originally gathered by Sir Joseph Banks and Dr. Solander at "Oporagi" (Mercury Bay) during Cook's first visit to New Zealand in the year 1769. A few months later it was also observed in Queen Charlotte Sound. Dr. Solander, in his manuscript "Primitiæ Floræ Novæ Zelandiæ," which, to the great loss of botanical science, was never actually published, described it under the name of *Stiphelia acerosa*, and a beautiful plate of the plant was prepared under his superintendence. Solander's specific name was adopted by Gaertner in his work "De Fructibus," and also by Robert Brown in his well-known "Prodromus," the latter botanist transferring the plant to the genus *Cyathodes*. Since Cook's time it has been observed by all investigators of the botany of New Zealand, and is now known to be generally distributed throughout the whole length of the country, from the North Cape to Stewart Island. Although often abundant on coastal cliffs, it is plentiful inland, and ascends the mountains to a height of not much under 3,000 ft. It is also found in Tasmania and on certain portions of the coast-line of Victoria, but apparently is not so plentiful as in New Zealand.

Cyathodes acerosa usually forms a closely branched shrub from 6 ft. to 12 ft. in height. Occasionally it reaches a stature of 15 ft. or 16 ft., and some forms with a procumbent mode of growth do not rise much more than 2 ft. or 3 ft. from the ground. The branches are hard and woody, and are clothed with numerous rigid and spreading narrow-linear pungent-pointed leaves. The flowers, which are often abundantly produced, are very minute, and of a pale whitish-green colour. The berries, which persist for a long time, are about the size of a pea, and may be either white or red. It is an easy plant to cultivate, and succeeds in any ordinary garden-soil.

The nearest ally of *C. acerosa* is doubtless the Chatham Islands *C. robusta*, which differs mainly in the larger and broader leaves, which are not pungent-pointed, but end in a callous tip, and in the rather larger fruit. The Tasmanian *C. abietina* and *C. divaricata* are also related; but the first is a much smaller plant with broader leaves, and the second has smaller leaves, and a corolla bearded within.

In the arrangement of the *Epacridaceæ* given in "Die Naturlichen Pflanzenfamilien" (teil iv, abt. i, p. 76) Dr. O. Drude has followed the late Baron Mueller in merging *Cyathodes*, *Leucopogon*, and numerous other genera with *Stiphelia*; and Dr. Cockayne in his publications has accordingly transferred the New Zealand species of *Cyathodes* and *Leucopogon* to that genus. To my mind, however, the remarks published by Mr. Bentham in the "Flora Australiensis" (vol. iv, p. 145) show very clearly that nothing is gained by such a course, while it necessarily leads to much confusion. It must be borne in mind, too, that both Mueller and Drude still keep up the genera as sections of *Stiphelia*, which is practically the same arrangement under another name. Nor does it seem that recent workers in the family maintain the proposed change. Dr. Diels, for instance, in his "Fragmenta Phytographiæ Australiæ Occidentalis," retains the genera *Cyathodes*, *Leucopogon*, &c., very much as limited by Bentham.

PLATE 124. *Cyathodes acerosa*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, branchlet with flower, showing the imbricated bracts on the peduncle ($\times 3$); 2, flower ($\times 7$); 3, flower, with the corolla and a portion of the calyx removed ($\times 7$); 4, corolla laid open ($\times 7$); 5 and 6, front and back view of anther ($\times 10$); 7, longitudinal section of ovary ($\times 9$); 8, transverse section of ovary ($\times 8$); 9, fruit ($\times 3$); 10, section of fruit ($\times 3$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

CYATHODES COLENSOI, Hook f.

PLATE 125.—CYATHODES COLENISOI.

FAMILY EPACRIDACEÆ.

[GENUS CYATHODES, LABILL.

Cyathodes Colensoi, Hook. f. *Handb. N.Z. Fl.* 177; *Cheesem. Man. N.Z. Fl.* 412.

Cyathodes Colensoi is one of the many discoveries that we owe to the unwearied diligence of Mr. Colenso. It was first gathered by him in February, 1847, at the eastern base of Tongariro. Speaking of it in his "Journeys to the Ruahine Range," p. 39, he says, "During the former part of this day I met with several botanical novelties—*e.g.*, a very handsome full-flowered *Cyathodes* (*C. Colensoi*), a low bushy shrub of depressed growth, some plants bearing white and some red berries in profusion. This will become a garden flower." In following years he also collected it on the Ruahine Mountains and in other localities, and it was solely from his specimens that the species was described by Sir J. D. Hooker in the "Flora," where, however, it was treated as a *Leucopogon*. Since that time, however, the range of the plant has been more fully worked out. In addition to the localities given by Colenso, it has been recorded from the Kaimarawa and Tararua Mountains, in the North Island. In the South Island it is fairly plentiful on the mountains of Nelson and Canterbury, but mainly on the eastern side of the dividing-range. It was not gathered by Mr. Townson in the vicinity of Westport, nor do I find it quoted in the list of plants collected by Mr. Hamilton near Okarito. In Otago it appears to be local, but it has been gathered in isolated localities as far south as the Blue Mountains. Its altitudinal range is from 2,000 ft. to 5,000 ft.

On the central volcanic plateau of the North Island, where I have had repeated opportunities of observing it, *C. Colensoi* forms broad depressed patches 2 ft. to 6 ft. in diameter, the branches rising to a height of from 3 in. to 3 ft. The leaves are linear-oblong, obtuse or shortly mucronate, and glaucous beneath, while the flowers are arranged in terminal racemes. The berries are considerably smaller than those of *C. acerosa*. Although generally found in localities where the grass *Danthonia Raoulia* is the predominant species, it is often associated with other shrubs, as *Pentachondra*, *Coprosma depressa*, *Gaultheria antipoda*, &c., and with *Celmisia spectabilis* and other herbaceous plants.

C. Colensoi does not seem to be very closely allied to any of the New Zealand species. Sir J. D. Hooker, in the "Handbook," states that it is "intermediate between *Cyathodes* and *Leucopogon* in characters, but with the habit of the former genus, to which I have referred it, both on this account and because of its extremely close affinity with *C. Tameiameia*, Cham., of the Sandwich Islands; it is also most closely allied to *Leucopogon suaveolens* of the Borneo Alps, which may be a *Cyathodes*." I have had no opportunity of comparing the New Zealand plant with the two species mentioned by Hooker.

PLATE 125. *Cyathodes Colensoi*, drawn from specimens collected on Dun Mountain, Nelson, by Mr. F. G. Gibbs. Fig. 1, portion of branchlet with two flowers ($\times 4$); 2, flower, with the corolla removed ($\times 5$); 3, corolla laid open ($\times 5$); 4 and 5, front and back view of anther ($\times 7$); 6, ovary ($\times 5$); 7, longitudinal section of ovary ($\times 5$); 8, ripe fruit ($\times 5$); 9, transverse section of same ($\times 5$); 10, longitudinal section of same ($\times 5$); 11, embryo ($\times 10$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

LEUCOPOGON FASCICULATUS, A. Rich.

PLATE 126.—LEUCOPOGON FASCICULATUS.

FAMILY EPACRIDACEÆ.]

[GENUS LEUCOPOGON, R. BR.

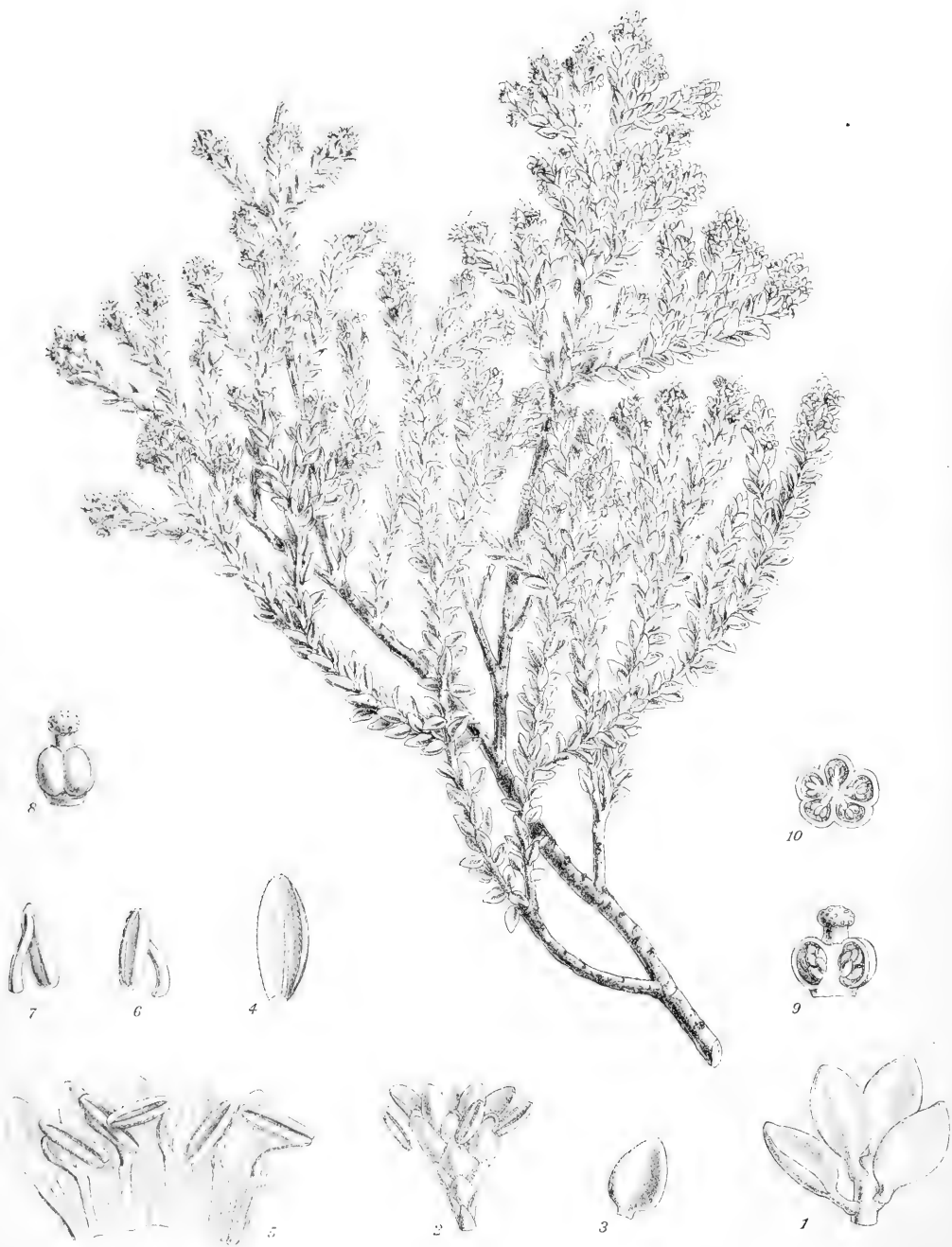
Leucopogon fasciculatus, A. Rich. Fl. Nouv. Zel. 215; Cheesem. Man. N.Z. Fl. 413.

Our knowledge of the subject of this plate dates back to the time of Cook's first visit to New Zealand in the year 1769, when it was collected by Banks and Solander in Mercury Bay, or "Opuragi" as they called it. A full description of the plant, together with an excellent plate, were prepared for Solander's "Primitiæ Floræ Novæ Zelandiæ," a work which remains unpublished up to the present day. Forster also gathered it in Queen Charlotte Sound during Cook's second voyage, and it was duly published in his "Prodromus" under the name of *Epacris fasciculata*. In 1832 A. Richard, in the "Flore de la Nouvelle Zélande," transferred it to *Leucopogon*, at the same time giving a much fuller description prepared from Forster's notes.

Leucopogon fasciculatus has a wide range. In the North Island it is found from the Three Kings Islands and the North Cape southwards to Cook Strait, and is abundant from the sea-coast to a considerable height on the mountains of the interior—probably well over 3,500 ft. In the South Island it is plentiful in the Nelson Provincial District, and extends through Marlborough and Canterbury to Banks Peninsula. I have seen no specimens from any locality further south; and although Mr. Buchanan has recorded it in his florula of Otago (Trans. N.Z. Inst. vol. i), it is not mentioned in either Petrie's or Kirk's lists.

L. fasciculatus is generally known to European settlers in the northern part of the Dominion by its Maori name of mingimingi; which, unfortunately, is also applied to *Cyathodes acerosa*, *Coprosma propinqua*, and *C. linariifolia*. It usually forms a shrub or small tree 5 ft. to 15 ft. high, or even more, and attains its greatest height in open forests. North of the Waikato River it is a frequent constituent of the undergrowth in kauri forests, together with *Dracophyllum latifolium* and *Cyathodes acerosa*, *Phebalium nudum*, *Melicope macrophylla*, *Alseuosmia macrophylla*, *Astelia trinervia*, &c. It is, however, most generally seen on the large expanses of rolling *Leptospermum*-clad hills, which form such a prominent feature of the landscape in the north part of the North Island, and especially north of Auckland. In such situations it is frequently much shorter and more densely branched. On sand-dunes, on wind-swept seacliffs, and in some mountain localities, it is often procumbent or even prostrate and closely branched, but not rising to any great height above the ground.

PLATE 126. *Leucopogon fasciculatus*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, branchlet, with a pendulous raceme of flowers ($\times 3$); 2, flower ($\times 8$); 3, corolla laid open ($\times 8$); 4 and 5, front and back view of anther ($\times 10$); 6, ovary ($\times 8$); 7, longitudinal section of ovary ($\times 10$); 8, transverse section of an ovary with 2 cells ($\times 10$); 9, the same with 3 cells ($\times 10$); 10, fruit ($\times 3$); 11, seed ($\times 5$).



M. Smith del.
J. N. Fitch lith

West, Newman imp.

EPACRIS ALPINA, Hook f.

PLATE 127.—EPACRIS ALPINA.

FAMILY EPACRIDACEÆ.]

[GENUS EPACRIS, FORST.

Epacris alpina, Hook. *J. Fl. Nov. Zel.* i. 166; *Cheesem. Man. N.Z. Fl.* 116.

Epacris alpina was one of the plants discovered by Mr. J. C. Bidwill on the central volcanic plateau of the North Island in the year 1839—most probably on the lower slopes of Ngauruhoe, which he was the first European to ascend. A few years later it was collected by Mr. Colenso in the same district. It is now known to be a most abundant plant on the slopes of Tongariro, Ngauruhoe, and Ruapehu, and on the high country around them, ascending to quite 5,000 ft., and in many places forming no small proportion of the shrubby vegetation. It has also been observed on the Kaimanawa and Ruahine Mountains, and on the Kaweka Range, in Hawke's Bay. Curiously enough, it does not seem to have been noted on any portion of the Tararua Range, although I cannot doubt that it exists thereon. Its northern limit appears to be on the summit of Mount Tauhara, at the north end of Lake Taupo, where I collected it many years ago. In the South Island I have observed it in great abundance on the eastern portion of Mount Owen, at an elevation of 4,000 ft.; while Mr. Townson has collected it on Mount Rochfort, and Mr. Caffin near Denniston. In the "Handbook" it is recorded as growing with *Pentachondra* on the Southern Alps, on the authority of Sinclair and Haast, but I am ignorant of the exact locality.

I have had many opportunities of observing *E. alpina* on the central plateau of the North Island. It usually forms a densely branched bush 1 ft. to 3 ft. in height, often decumbent at the base, but with the upper branches strictly erect and clothed with numerous broadly ovate thick and coriaceous leaves seldom more than $\frac{1}{6}$ in. in length. The flowers are white, and are abundantly produced towards the tips of the branchlets. As a species it is allied to *E. pauciflora*, but can always be distinguished by its smaller size, by its more spreading habit and more numerous branches, and by the smaller and more obtuse leaves. The chief shrubby plants associated with *E. alpina* on the volcanic plateau are *Senecio Bidwillii*, *Olearia nummularifolia*, *Cassinia Vauvilliersii*, *Coprosma cuneata* and *C. depressa*, *Dracophyllum recurvum* and *D. subulatum*, *Veronica tetragona*, *Podocarpus nivalis*, *Dacrydium Bidwillii* and *D. laxifolium*, and *Phyllocladus alpinus*.

PLATE 127. *Epacris alpina*, drawn from specimens collected near the base of Ngauruhoe; altitude 3,000 ft. Fig. 1, branchlet with leaves ($\times 5$); 2, flower, with the imbricated bracts below the calyx ($\times 5$); 3, one of the bracts ($\times 8$); 4, a single sepal ($\times 8$); 5, corolla laid open ($\times 8$); 6 and 7, front and back view of anther ($\times 8$); 8, ovary ($\times 8$); 9, longitudinal section of ovary ($\times 10$); 10, transverse section of same ($\times 10$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

ARCHERIA RACEMOSA, Hook. f.

PLATE 128.—ARCHERIA RACEMOSA.

FAMILY EPACRIDACEÆ.]

[GENUS ARCHERIA, HOOK. F.

Archeria racemosa, Hook. f. *Handb. N.Z. Fl.* 180; *Cheesem. Man. N.Z. Fl.* 117.

The Great and Little Barrier Islands, with the Cape Colville (or Thames) Peninsula, contain several plants which are either confined to the two districts or occur in small quantity outside them. The chief of these are *Pseudopanax discolor* (see Plate 74 of this work), *Olearia Allomii*, *Celmisia Adamsii*, *Senecio myrianthos*, *Veronica pubescens*, and the subject of this plate. From a phyto-geographical point of view the Thames Peninsula is also remarkable from being the northern limit of certain well-known subalpine plants. A full list of these is given in Mr. Adams's interesting paper "On the Botany of Te Mochau Mountain," the highest elevation in the district (*Trans. N.Z. Inst.* xxi (1889), 32), but the following may be particularized here: *Celmisia incana*, *Pentachondra pumila*, *Cyathodes empetrifolia*, *Ourisia macrophylla*, *Podocarpus nivalis*, *Dacrydium Bidwillii*, *Phyllocladus alpinus*, *Carpha alpina*, and *Oreobolus pumilio*. With the exception of the *Cyathodes* and *Phyllocladus*, the first of which occurs on Castle Rock, Coromandel, and the other on the summit of Te Aroha Mountain, not one of these plants is found nearer than the summit of Hikurangi, in the East Cape district, or on the central volcanic plateau of the North Island.

Archeria racemosa was collected on the Great Barrier Island prior to 1850 by Captain D. Rough, the first Harbourmaster for the Port of Auckland. Imperfect specimens given by him to Dr. Sinclair were forwarded to Sir J. D. Hooker, and were described as a doubtful *Epacris* in the "Flora Novæ Zelandiæ"; but in the "Handbook" it was placed in the Tasmanian genus *Archeria*. In the year 1867 Mr. T. Kirk visited the Great Barrier, when *A. racemosa* was again gathered. Mr. Kirk remarks, however, that it is a local plant, "only found between 800 ft. and 2,000 ft. alt." In 1869 Mr. Kirk also observed it at the Thames goldfields, stating that "it is local, but abundant from 1,900 ft. to 2,800 ft." In 1881 I observed it in immense abundance on Whakairi, or Table Mountain, near the source of the Kauaeranga River, and on several of the higher mountains in the vicinity. Mr. J. Adams, who in the years 1882 to 1905 zealously explored the whole length of the Thames Peninsula, ascertained that it is of common occurrence on the central watershed, but is rarely found on the flanking ranges to the east and west. In 1895 Mr. Shakespear and myself noted it in great quantities on the summit of the Little Barrier Island, alt. 1,500 ft. to 2,400 ft. A few years later Bishop Williams unexpectedly discovered it at Te Araroa, near the East Cape, and Mr. Gerald Williams has since found it to be fairly plentiful near the base of Hikurangi Mountain. These two localities mark the southern limit of the plant.

Archeria racemosa forms a branching shrub 6 ft. to 15 ft. high, with much of the habit and appearance of a broad-leaved *Leucopogon*. When in flower it presents an attractive appearance, in the first place from its broad coloured bracts, which completely conceal the flowers until they commence to expand, when they suddenly drop off; and then from the abundance of the flowers themselves, which are bright pink in colour. At the present time it is not in cultivation.

PLATE 128. *Archeria racemosa*, drawn from specimens collected on the summit of the Little Barrier Island; altitude 2,000 ft. Fig. 1, under-surface of leaf ($\times 2$); 2, bract, two bracteoles, and a young flower-bud ($\times 3$); 3, flower ($\times 6$); 4, corolla laid open, showing the ovary ($\times 6$); 5, longitudinal section of ovary ($\times 8$); 6, transverse section of same ($\times 8$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

DRACOPHYLLUM LATIFOLIUM, A. Cunn.

PLATE 129.—DRACOPHYLLUM LATIFOLIUM.

FAMILY EPACRIDACEÆ.]

[GENUS DRACOPHYLLUM, LABILL.

Dracophyllum latifolium, A. Cunn. *Procur.* n. 412; *Cheesem. Man. N.Z. Fl.* 419.

The genus *Dracophyllum* is of considerable physiognomic importance in the New Zealand flora. Most of the species have a distinct aspect of their own; and in particular the two largest (*D. latifolium* and *D. Traversii*), with their candelabrum-like mode of growth, and tufts of long grassy leaves at the tips of the otherwise naked branches, present an appearance so remarkably distinct that the attention of the most incurious person is at once arrested.

Dracophyllum latifolium, the *neinei* of the Maoris, was originally gathered by the well-known botanist Allan Cunningham in dry woods by the Kawakawa River, Bay of Islands, in the year 1826. Most subsequent explorers have met with it, and it is now known to be present in all forests of any size from the North Cape to Taranaki and the East Cape. It is found in small quantity in Hawke's Bay, but I have seen no specimens from any portion of the Wellington Provincial District. In the South Island it stretches along the western portion of the Nelson Provincial District from Collingwood to Westport, and then southwards to Charleston, which appears to be its southern limit.

D. latifolium is a shrub or small tree 8 ft. to 20 ft. high, with a trunk 4 in. to 12 in. in diameter. Young plants form erect unbranched rods with a tuft of grassy leaves at the top; but when mature the plant is usually branched, the branches curving outwards and then upwards, thus giving the plant a candelabrum-like appearance. The leaves are crowded at the ends of the branches, giving them a mop-headed look, and the flowers are very numerous in an erect terminal panicle sometimes 18 in. long. The plant is usually found in dry woods, and almost invariably forms a distinctive portion of the undergrowth in kauri forests. It is also commonly seen along the crests of steep wooded ridges.

The wood is said to be durable, and suitable for veneering or inlaying, or for ornamental work generally. But the small size of the tree, and the difficulty in obtaining it in quantity, will always prevent much use being made of it. The unbranched stems, which are often naturally and prettily fluted, are often converted into walking-sticks, for which their strength and toughness appear to specially fit them.

PLATE 129. *Dracophyllum latifolium*, drawn from specimens collected on the Little Barrier Island by Miss Shakespear. Fig. 1, portion of inflorescence ($\times 4$); 2, flower, with the corolla removed ($\times 5$); 3, corolla laid open ($\times 5$); 4 and 5, front and back view of anthers ($\times 7$); 6, ovary, with the hypogynous scales at its base ($\times 7$); 7, longitudinal section of ovary, showing the decurved placentas proceeding from the inner angle of the cell ($\times 10$); 8, fruit ($\times 5$); 9, seed (enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

DRACOPHYLLUM TOWNSONI, *Cheesem.*

PLATE 130.—DRACOPHYLLUM TOWNSONI.

FAMILY EPACRIDACEÆ.]

[GENUS DRACOPHYLLUM, LABILL.

Dracophyllum Townsoni, *Cheesem. Man. N.Z. Fl.* 420.

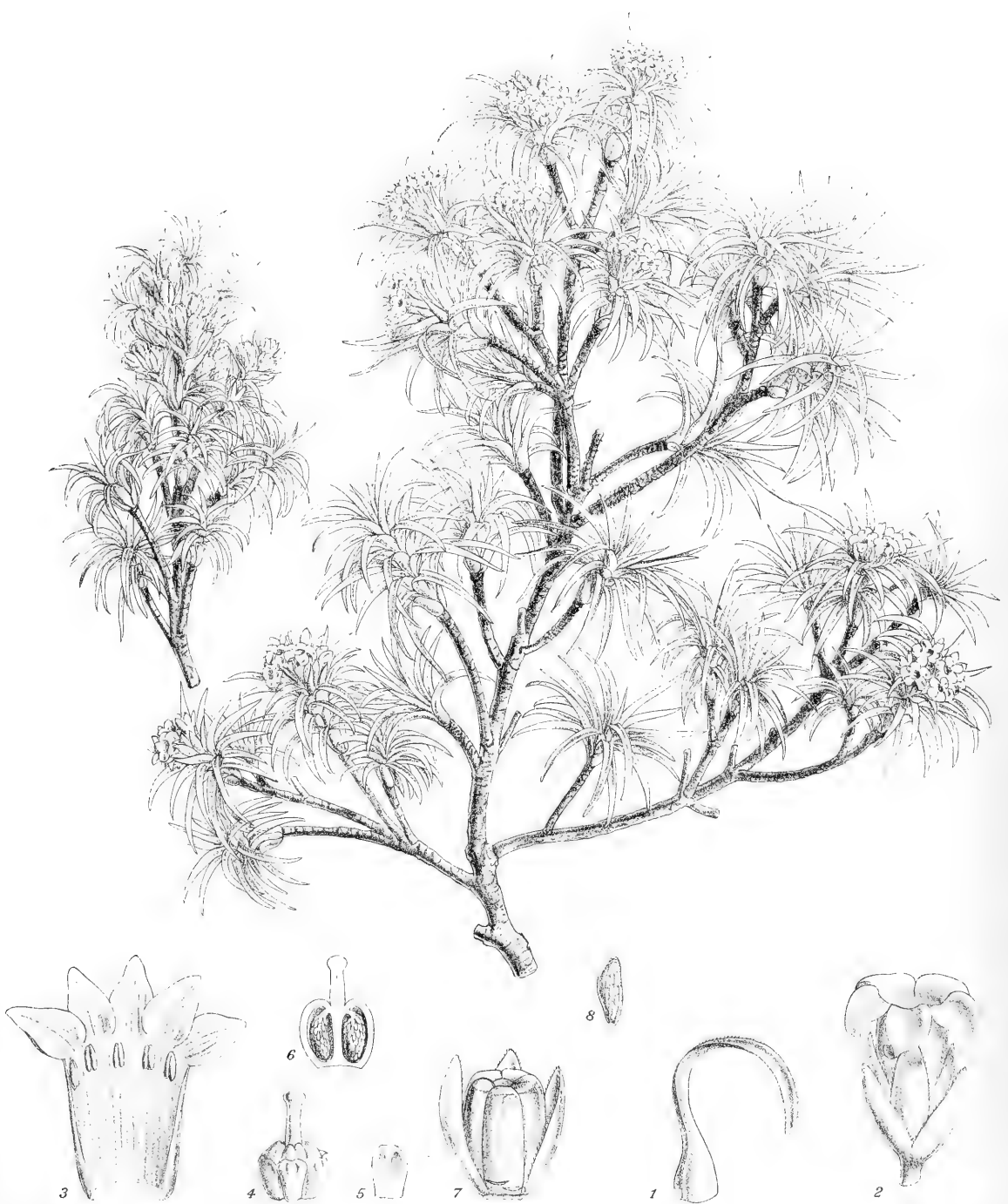
The subject of this plate commemorates the name of Mr. W. Townson, who for several years assiduously explored the vegetation of the north-western portion of the South Island, from the Karamea River southwards to Greymouth, and inland along the course of the Buller River to Mount Mantell, Mount Murchison, and Mount Owen. Much of this large district had never been closely botanized, and Mr. Townson consequently secured a rich harvest of novelties. Among these may be mentioned *Aciphylla Townsoni* (Plate 62 of this work), *Celmisia dubia*, *Dracophyllum pubescens*, *Gentiana Townsoni* (Plate 139), *Veronica divergens* (Plate 148), *Veronica coarctata*, and *Townsonia deflexa* (Plate 198).

Dracophyllum Townsoni was obtained on the foothills and terraces at the base of Mount Buckland, the northern termination of the chain of the Paparoa Mountains, and which overlooks the well-known Buller Gorge. It is by no means abundant, but occurs sporadically from about 500 ft. to 2,500 ft. elevation. So far it has not been found in any other locality, although it probably extends southwards into the Westland Provincial District, the flora of which is very imperfectly known.

According to its discoverer, *D. Townsoni* forms a small branching tree 10 ft. to 20 ft. in height, with its branches conspicuously ringed with the scars of the fallen leaves. The leaves are very similar to those of *D. latifolium*, and are narrowed into the same long and slender points; but are smaller, seldom exceeding 12 in. in length, and narrower at the base. The inflorescence is markedly different, consisting of a small curved and drooping panicle 2 in. to 3 in. long, placed on the branch just below the leaves. The flowers, which according to Mr. Townson are decidedly fœtid, are rather small, being about $\frac{1}{8}$ in. long; and the capsules are about $\frac{1}{8}$ in. in diameter.

The nearest ally of our plant is undoubtedly *D. Menziesii*, which has the same lateral drooping panicle and a very similar habit of growth. But *D. Menziesii* is a much smaller plant, often reduced to a foot or two in height; the leaves are shorter and broader, and more cartilaginous; and the flowers are altogether different, being almost twice the size, with a much larger corolla, the lobes of which are not more than a quarter the length of the tube, whereas in *D. Townsoni* the lobes are half the length of the tube or nearly so. I entertain no doubt as to the specific distinctness of the two plants.

PLATE 130. *Dracophyllum Townsoni*, drawn from specimens collected by Mr. Townson on Mount Buckland, near the mouth of the Buller River. Fig. 1, portion of margin of leaf ($\times 5$); 2, flower ($\times 5$); 3, longitudinal section of corolla ($\times 5$); 4, anther ($\times 5$); 5, ovary, with the hypogynous scales forming a cup-shaped disc ($\times 5$); 6, the same with the scales distinct ($\times 5$); 7, section of ovary ($\times 8$); 8, fruit ($\times 5$); 9, seed ($\times 5$).



M. Smith del.
J. N. Eitch lith

West, Newman imp.

DRACOPHYLLUM RECURVUM, Hook. f.

PLATE 131.—DRACOPHYLLUM RECURVUM.

FAMILY EPACRIDACEÆ.]

[GENUS DRACOPHYLLUM, LABILL.

Dracophyllum recurvum, Hook. J. Fl. Antarct. i, 50; Handb. N.Z. Fl. 181; Cheesem. Man. N.Z. Fl. 122.

In this series of plates I have already figured several plants which constitute a prominent portion of the vegetation of the lower slopes of Tongariro, Ngauruhoe, and Ruapehu; and of the elevated volcanic plateau upon which these mountains stand. The species now illustrated is another conspicuous member of what must be considered a very peculiar and noteworthy type of subalpine vegetation, differing in many respects from that of other mountain districts in the North Island.

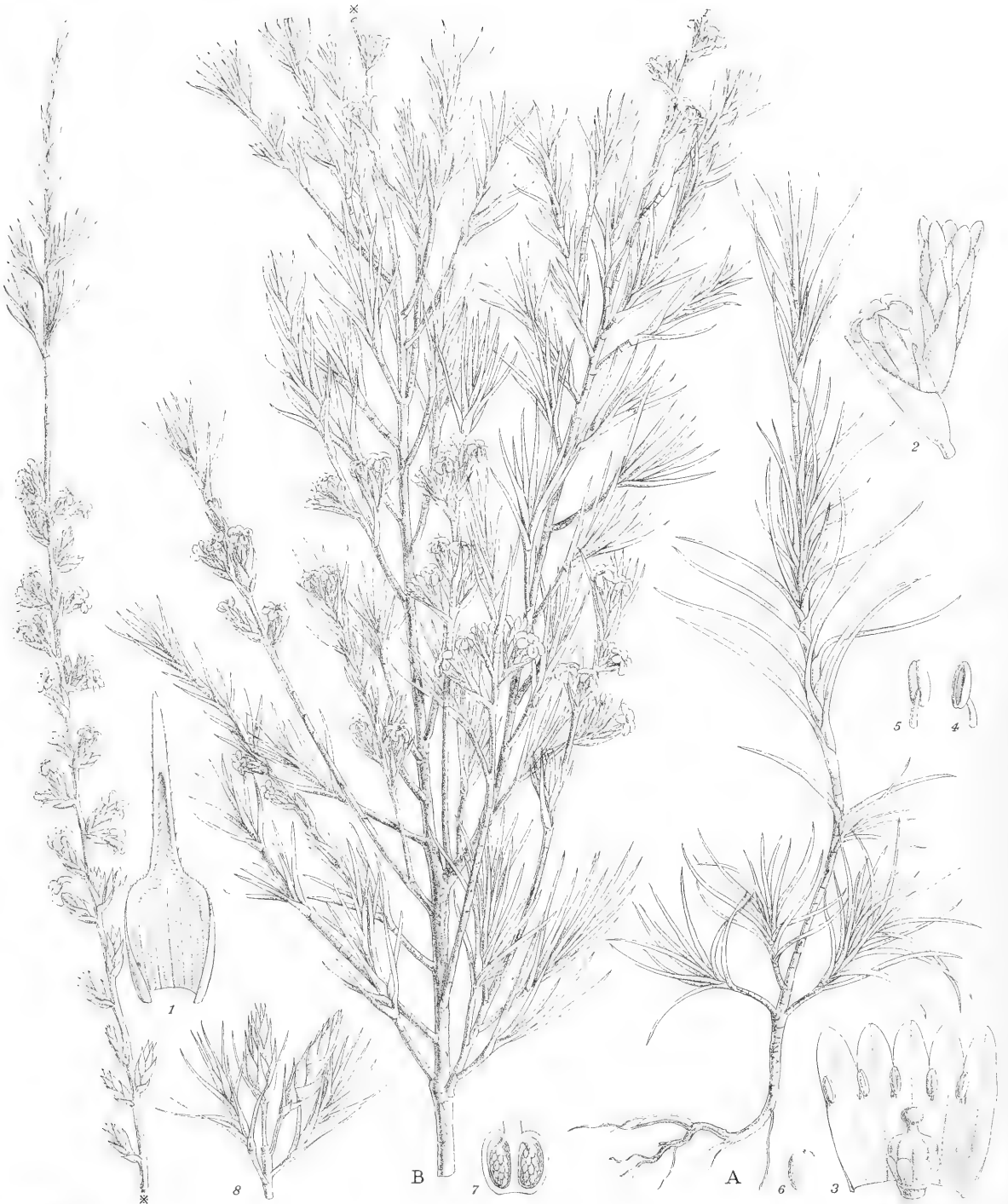
For the discovery of *Dracophyllum recurvum* we are indebted to Mr. J. C. Bidwill, who gathered it during a visit to Tongariro and Ngauruhoe in the year 1839. A few years later it was collected by Mr. Colenso on the eastern side of the same mountains. He has also recorded it from the Ruahine Mountains, and from the summit of Mount Hikurangi, in the East Cape district. Since then it has been noticed by all travellers to the interior of the North Island, and is now known to be a most abundant plant on the lower slopes of Tongariro, Ngauruhoe, and Ruapehu, also on the adjoining mountains of Kakaramea, Hauhungatahi, &c. It ascends the neighbouring Kaimanawa Mountains to quite 5,000 ft., but so far has not been found on any part of the Tararua Range.

D. recurvum is a stout much branched procumbent or almost prostrate shrub, forming dense masses 2 ft. to 5 ft. in diameter, but not usually rising more than 1 ft. to 2 ft. from the ground. The leaves are crowded at the tips of the branches, spreading and recurved, the base broad and sheathing, and then narrowed into a linear-subulate lamina about 1 in. in length. The flowers are arranged in short and stout bracteate terminal spikes about 1 in. long, the individual flowers being about $\frac{1}{4}$ in. The whole plant has a reddish-brown colour, which, at heights of about 4,000 ft., it often imparts to wide stretches of subalpine scrub.

Under the plate of *Senecio Bidwillii* (t. 114) I have mentioned the chief plants which, together with that species and *D. recurvum*, go to make up the greater part of the subalpine scrub of the central volcanic plateau of the North Island. Those students who wish to familiarize themselves with what is known of the æcology of this very curious association should refer to Dr. Cockayne's "Report of a Botanical Survey of the Tongariro National Park."

Although *D. recurvum* varies to some extent in the size of all its parts, it is otherwise a remarkably well-defined species, easily separated from all others by its peculiar habit, linear-subulate patent and recurved leaves, and terminal bracteate spikes. I must confess my total inability to distinguish, even as varieties, the five "new species" described by Mr. Colenso in various volumes of the "Transactions of the New Zealand Institute," and particularized as synonyms of *D. recurvum* in my Manual.

PLATE 131. *Dracophyllum recurvum*, drawn from specimens collected at the base of Mount Ruapehu, at an altitude of 3,500 ft. Fig. 1, leaf ($\times 2$); 2, flower ($\times 5$); 3, corolla laid open ($\times 5$); 4, ovary ($\times 5$); 5, scale from base of ovary ($\times 7$); 6, longitudinal section of ovary ($\times 5$); 7, ripe capsule ($\times 5$); 8, seed ($\times 8$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

DRACOPHYLLUM SUBULATUM, Hook f.

PLATE 132.—DRACOPHYLLUM SUBULATUM.

FAMILY EPACRIDACEÆ.]

[GENUS DRACOPHYLLUM, LABILL.

Dracophyllum subulatum, Hook. f. *Fl. Antart.* i. 50; *Handb. N.Z. Fl.* 182; *Cheesem. Man. N.Z. Fl.* 425.

Dracophyllum subulatum, like the species figured in the previous plate, was one of the many interesting discoveries made by Mr. J. C. Bidwill in 1839 during his adventurous journey to Rotorua, Taupo, and Tongariro. Mr. Colenso, who was the second botanical explorer to reach these districts, found the same plant over a much wider area. He first gathered it in January, 1842, near the Rangitaiki River, not far from the present Township of Galatea, while journeying from Lake Waikaremoana (which he was the first European to visit) to Rotorua. In 1847 he again collected it on "barren pumice plains near Tarawera," between Napier and Taupo; and, later on in the same journey, on the eastern flanks of Tongariro. Other early explorers also obtained it on both the Kaimanawa and Ruahine Mountains.

The centre of distribution of the species is undoubtedly the open pumiceous country surrounding Lake Taupo, where it is extremely plentiful, often forming close-growing patches of half an acre in extent, recognizable from afar by the dark-brown colour. From thence it stretches to Tarawera and the Mohaka country, and northwards along the Rangitaiki Valley to far below Galatea—quite possibly to the Bay of Plenty. Westwards it extends to Rotorua, and down the valley of the Waikato almost as far as Cambridge, and the Thames Valley to Matamata, which appears to be its northern limit.

D. subulatum is an erect fastigiately branched shrub 2 ft. to 6 ft. high, the branches being long and slender, and leafy at the tips only. The leaves are small and erect, under an inch in length, very narrow and pungent-pointed. The flowers are small, white, and arranged in 2-6-flowered lateral racemes. The species belongs to the same section of the genus as *D. Urvilleanum* and *D. scoparium*, but is readily distinguishable by its small size and erect slender habit, short strict narrow leaves, and small flowers.

PLATE 132. *Dracophyllum subulatum*, mature plant and seedling, drawn from specimens collected on the Taupo Plains. Fig. 1, leaf ($\times 6$); 2, portion of inflorescence ($\times 3$); 3, corolla laid open ($\times 3$); 4 and 5, front and back view of anther ($\times 10$); 6, scale from base of ovary ($\times 10$); 7, longitudinal section of ovary ($\times 10$); 8, branchlet, showing galls (natural size).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

SIDEROXYLON COSTATUM, F. Muell.

PLATE 133.—SIDEROXYLON COSTATUM.

FAMILY SAPOTACEÆ.]

[GENUS SIDEROXYLON, LINN.]

Sideroxylon costatum, F. Muell. *First Census Austral. Pl.* 92; *Cheesem. Man. N.Z. Fl.* 435.

The tawaapou, which is the name applied by the Maoris to the subject of this plate, was first collected by Richard Cunningham in the year 1833 on the coast opposite to the Cavallos Islands, between the Bay of Islands and Whangarei. In 1836 Mr. Colenso gathered it at the entrance to Whangarei Harbour, a locality where it still exists; and in 1841 he also observed it on the "high south headlands of Whangaruru Bay." Since that time it has been recorded from numerous localities on the eastern side of the North Island, but always in small quantity, and never far from the coast. It occurs on several of the headlands in the North Cape district; in one or two stations on the coast-line between Mongonui and Whangaroa; between Whangaroa and the Bay of Islands; at Cape Brett, Whangaruru Harbour, and Whangarei Heads; on the Poor Knights Islands, the Hen and Chickens, the Great and Little Barrier Islands, and Kawau Island. In the Hauraki Gulf a single small grove occurs on Motutapu Island, and several on Waiheke Island. It has been observed on Cape Colville, and on Cuvier Island, and probably also exists on the islands in the Bay of Plenty, which have never yet been botanically explored. It attains its southern limit at Tolaga Bay, in the East Cape district, where a single tree grows not far from a spring, which according to tradition was used by Cook's sailors when he visited the locality in 1769. On the western coast of the North Island only two localities are known—near Maunganui Bluff, between the Hokianga and Kaipara Harbours; and the strip of rocky coast just to the north of the Manukau Harbour.

S. costatum is a handsome closely branched tree 25 ft. to 45 ft. high, rarely more, with a trunk 1 ft. to 3 ft. in diameter. The branchlets and petioles are more or less lactescent, and the leaves are marked with numerous closely placed parallel veins running straight from the midrib to the margin. The flowers are solitary or two together in the axils of the leaves, and are succeeded by large oblong or obovoid berries, sometimes over an inch in length. Usually these have two or three bony seeds, but sometimes the seeds are reduced to one, and occasionally there are as many as four. According to Mr. Colenso, the seeds were formerly used by the Maoris as beads for necklaces—no doubt from their hard, smooth, and polished surface.

So far I have assumed that our New Zealand plant is identical with the Norfolk Island *S. costatum*. But as far back as 1875 this was questioned by the late Baron Mueller, who proposed the name of *Achras novo-zelandicum* for the New Zealand form. At my request Mr. W. B. Hemsley has compared specimens from the two localities, and reported ("Kew Bulletin," 1908, 459): "Comparing the Norfolk Island specimens with those from New Zealand, I think Mueller was right. The leaves of the Norfolk Island plant are, on the whole, larger, thicker, more tapering towards the base, and the petioles are longer. The flowers are usually in pairs in typical *A. costata*, and solitary in the New Zealand specimens we have seen." If the correctness of this view is established, our plant will in future bear the name of *S. novo-zelandicum*, Hemsl.

PLATE 133. *Sideroxylon costatum*, drawn from specimens collected on the Little Barrier Island by Miss Shakespear. Fig. 1, flower with a 5-lobed corolla ($\times 4$); 2, centrally affixed hairs ($\times 12$); 3, corolla laid open ($\times 4$); 4, anther ($\times 8$); 5, ovary ($\times 5$); 6, longitudinal section of ovary ($\times 5$); 7, flower, with a 4-lobed corolla ($\times 4$); 8, seed ($\times 2$); 9, section of same, showing embryo ($\times 2$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

OLEA LANCEOLATA, Hook. f.

PLATE 134.—OLEA LANCEOLATA.

FAMILY OLEACEÆ.]

[GENUS OLEA, LINN.

Olea lanceolata, Hook. f. *Fl. Nov. Zel.* i, 176; *Cheesem. Man. N.Z. Fl.* 438.

The New Zealand olives differ in a marked manner from their relatives of the Northern Hemisphere in the flowers being invariably apetalous. The first species discovered, the Norfolk Island *O. apetala*, was therefore selected by Endlicher as the type of a separate genus, to which he applied the name of *Gymnelœa*. But in the Indian *O. dioica*, where the male flowers have a corolla, the females have none, thus clearly proving that the absence of a corolla is not sufficient by itself for generic distinction. Recent botanists have therefore refused to entertain the idea of subdividing the genus.

Olea lanceolata is the most abundant species in New Zealand, and has the widest distribution. It was probably first discovered by Allan Cunningham, and confounded by him with one of the species of his genus *Mida*, now included by botanists under *Fusanus Cunninghamii*. This mistake is even occasionally made at the present day. Mr. Colenso and Dr. Sinclair are the two earliest botanists who are positively known to have collected the plant. It is now known to be an abundant constituent of the lowland forests of the North Island, from the North Cape to Cook Strait, and from sea-level to an altitude of 2,000 ft. or thereabouts. It is also found in a few localities in the Nelson Provincial District, where, however, it is decidedly rare.

O. lanceolata is one of the trees to which the Maori name of maire is applied. It usually forms a closely branched round-headed tree 20 ft. to 50 ft. high, rarely more, with a trunk 1 ft. to 3 ft. in diameter. It is closely allied to *O. Cunninghamii*, which is a taller and stouter plant, with larger broader leaves, and with stouter pubescent racemes. *O. montana* is at once distinguished by the much narrower leaves and smaller racemes. Like all the New Zealand species of *Olea*, the leaves of young plants are markedly different from those of the adult, being much longer and narrower, and more acuminate.

All the New Zealand species of *Olea* produce a very similar timber, of great hardness and durability. The heart-wood is dark brown, often prettily marked with streaks of darker brown or almost black; the sap-wood is pale yellowish-brown. It is in every respect a timber of great value for any purpose requiring strength, hardness, durability, and evenness of grain; and it is somewhat curious that, notwithstanding its evident advantages, such small use is made of it. For ships'-blocks, wooden bearings for machinery, the framework of railway-carriages or tram-cars, door-knobs, and other ornamental turned-work it appears to be specially fitted. Its value was well known to the Maoris in olden times, who frequently used it for their digging-spades (*Ko, rapa-maire*), for flax-beaters or fern-root pounders (*paoti*), and for wooden meres or fighting-clubs (*mere-rakau*).

Mr. Elsdon Best, in his interesting paper on "Maori Forest Lore" (*Trans. N.Z. Inst.* vol. xl. (1908) 216), makes the following remarks in reference to the maire. "The maire-tree is the offspring of Te Pu-whakahara and Hine-pipi. The former was a son of Tane, and appears to be a star-name, or connected in some way with a star. An old saying applied to the hard-wooded maire is '*E kore e ngawhere, he maire tu wao, ma te toki e tua*'; meaning, 'It will not break (or work) easily; it

is a forest-standing maire, the axe alone can fell it.' This saying is also applied to persons. The timber is a favourite fuel for use in meeting-houses, as it gives out but little smoke and a good light; but if seeds are kept in a house in which maire is used for fuel, then such seeds will not germinate when planted. In former times, when forest-birds were numerous, the kereru (pigeon) and the koko (or tui) were wont to frequent in great numbers the maire-rau-nui trees to feed on the berries thereof, when great numbers would be snared, although they did not fatten on that diet."

PLATE 134. *Olea lanceolata*, drawn from specimens—male, female, and in fruit—collected in the Northern Wairoa district. Fig. 1, male flowers ($\times 5$); 2, male flower, with 3 stamens ($\times 5$); 3 and 4, front and back view of anthers ($\times 5$); 5, female flowers ($\times 6$); 6, longitudinal section of ovary ($\times 6$); 7, transverse section of ovary ($\times 6$); 8, fruit ($\times 2\frac{1}{2}$); 9, section of same ($\times 2\frac{1}{2}$); 10, embryo ($\times 6$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

PARSONSIA HETEROPHYLLA, A. Curr.

PLATE 135.—PARSONSIA HETEROPHYLLA.

FAMILY APOCYNACEÆ.]

[GENUS PARSONSIA, R. BR.

Parsonsia heterophylla, A. Cunn. *Precur.* n. 402; *Cheesem. Man. N.Z. Fl.* 440.

Judging from Solander's descriptions and drawings, both the species of *Parsonsia* known in New Zealand were observed in Cook's first voyage, either at "Opuragi" (Mercury Bay) or "Totaranui" (Queen Charlotte Sound). Solander, in his "Primitiæ Floræ Novæ Zelandiæ," applied the name of *Periploca capsularis* to both species, distinguishing the subject of this plate as var. *latifolia*, and the other, now known as *Parsonsia capsularis*, as var. *angustifolia*. But Solander's names were never actually published, and hence when Forster, in his "Prodromus," applied the name of *Periploca capsularis* to the small-flowered species with exerted anthers, the larger-flowered plant with included anthers was left without a name. Consequently A. Cunningham, who gathered it in several localities, and who fully recognized its differences from Forster's plant, was quite justified in bestowing upon it the very appropriate name of *Parsonsia heterophylla*.

P. heterophylla has a remarkably wide range, being found from the Three Kings Islands and the North Cape through the whole length of the North and South Islands to Stewart Island, and from sea-level to an altitude of nearly 3,000 ft. There are very few lowland or montane districts of moderate elevation in which it is not a fairly abundant plant. The allied species *P. capsularis*, although it has an almost equally extensive range, is far less plentiful, and is absent from several districts of considerable size. Both plants are of easy cultivation in any ordinary garden-soil, and are now frequently seen in gardens.

Both of our species of *Parsonsia* are remarkable for the heterophylly of their foliage, but it is more conspicuous in *P. heterophylla* than in *P. capsularis*. In the accompanying plate I have figured some of the chief leaf-variations seen in *P. heterophylla*, but it would require many plates to show the whole of those which can be observed. A plant cultivated for many years in my own garden started life as a seedling very similar to the one figured in the plate, and for some years the foliage showed little change. The leaves then became slightly broader, with more or less undulate or lobed margins. This tendency to irregularity in the margin of the leaf gradually increased, the margins being most irregularly lobed, those on the same branch showing great diversity of shape. Occasionally (compare with Hooker's remarks on Raoul's *P. rosea*, given in his "Floræ Novæ Zelandiæ," i, 180) one of the opposite leaves would be broad or narrow spatulate, while the other would be narrow linear or oblong. Gradually a considerable number of oblong leaves similar to those figured on the flowering specimen appeared, and the plant commenced to flower. This was the signal for a rapid disappearance of the spatulate and irregularly lobed leaves, and in three or four years all the leaves on the plant were of the same type as those of the flowering specimen shown on the plate.

PLATE 135. *Parsonsia heterophylla*, drawn from specimens obtained in the vicinity of Auckland, showing the difference between the foliage of the seedling, juvenile plant, and the adult. Fig. 1, flower (× 4); 2, section of same (× 5); 3, flower with the corolla removed, showing the calyx, glands, and ovary (× 5); 4 and 5, front and back view of anthers (× 10); 6, stigma (× 10); 7, longitudinal section of ovary (× 10); 8, seed (× 2); 9, section of same, showing embryo (× 7).



M. Smith del.
J. M. Fitch lith.

Wast, Newman imp.

GENIOSTOMA LIGUSTRIFOLIUM, A. Cunn.

PLATE 136.—GENIOSTOMA LIGUSTRIFOLIUM.

FAMILY LOGANIACEÆ.]

[GENUS GENIOSTOMA, FORST.

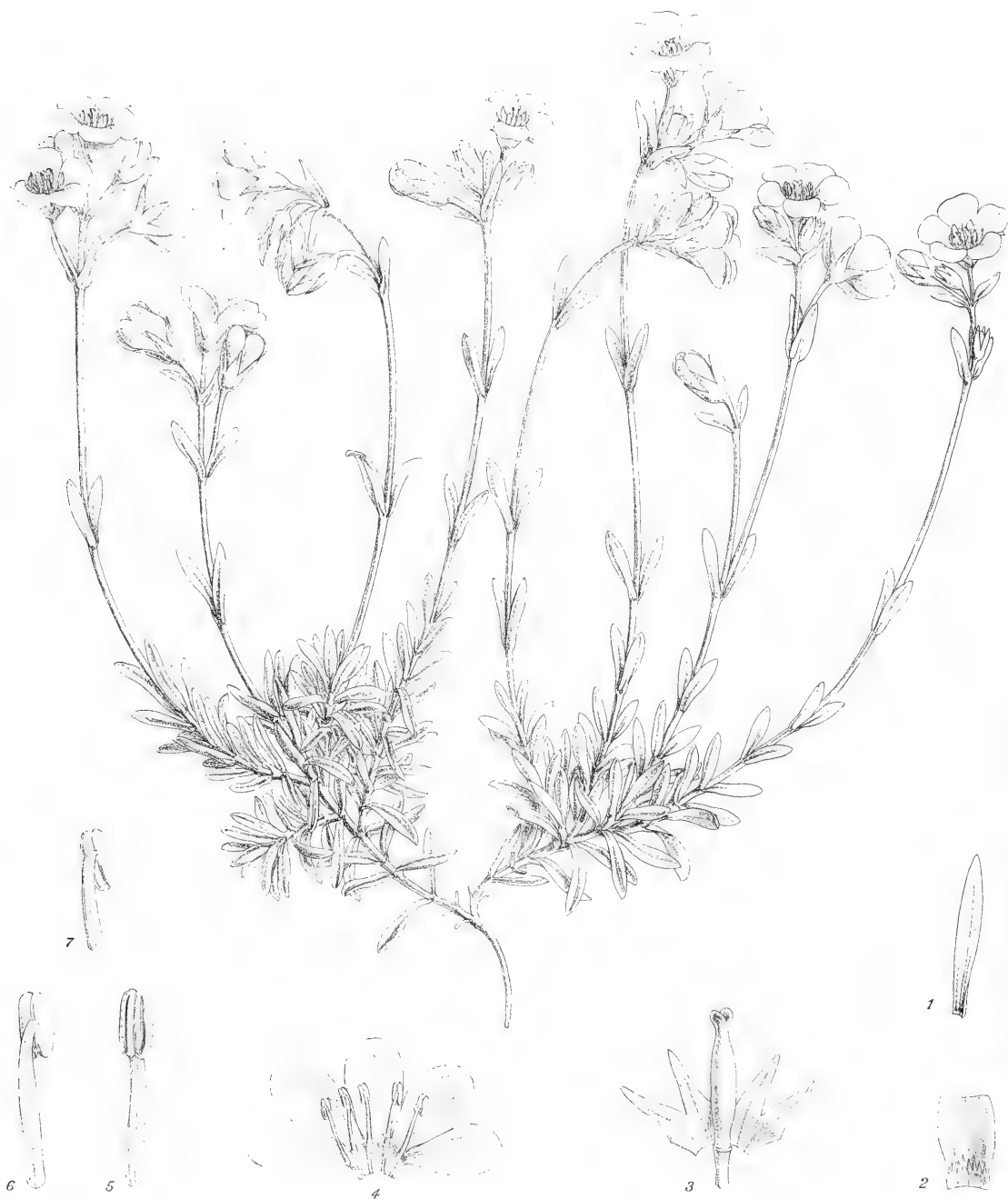
Geniostoma ligustrifolium, A. Gunn. *Precur.* n. 401; *Cheesem. Man. N.Z. Fl.* 444.

Geniostoma ligustrifolium is such a widely spread plant in the North Island that it could hardly escape the notice of the first investigators of the botany of the country. Hence it is not at all surprising that Banks and Solander, in Cook's first voyage, gathered it in every locality that they visited, with the exception of Poverty Bay. And this exception is easily accounted for, not because the plant does not exist there, but from the attitude of the Maoris, which was so threatening as to prevent the explorers from entering any copse or thicket, much less forest, in which stations alone could *Geniostoma* be observed. A full description and excellent plate were prepared under the direction of Solander, and still remain among the unpublished manuscripts in the Natural History Department of the British Museum.

After Cook's time all botanists visiting the North Island observed our plant. Its northern limit is the Three Kings Island and the North Cape, from which it extends southwards to Cook Strait. It is, however, purely a lowland plant, and I have not seen it at a greater elevation than about 2,000 ft. It also becomes comparatively scarce to the south of Wanganui and Napier. In the South Island it has been recorded from Marlborough by Buchanan, and from Pepin Island, to the north of Nelson, by Mr. F. G. Gibbs.

Geniostoma ligustrifolium is a perfectly smooth and glabrous much branched shrub 4 ft. to 12 ft. high, with brittle branches and soft pale-green leaves. Its leaves and young twigs have a peculiar heavy smell when bruised, which is still more conspicuous when the plant is in flower. It is readily eaten by cattle, which quickly break it down in all forests in which they are plentiful. It is well known to the Maoris by the name of hangehange, but I cannot ascertain that it was applied to any use by them, except that of preparing an extract which was considered to be a cure for certain skin-diseases in children.

PLATE 136. *Geniostoma ligustrifolium*, drawn from specimens collected on Rangitoto Island, near Auckland. Fig. 1, flower just expanding ($\times 4$); 2, the same fully expanded ($\times 4$); 3, section of flower with the corolla removed, showing calyx and ovary ($\times 6$); 4, corolla laid open ($\times 4$); 5 and 6, front and back view of anthers ($\times 10$); 7, transverse section of ovary ($\times 8$); 8, ripe fruit ($\times 2$); 9, seed ($\times 5$).



M. Smith del.
J. N. Fitch lith

West, Newman imp.

GENTIANA GRACILIFOLIA, *Cheesem.*

PLATE 137.—GENTIANA GRACILIFOLIA.

FAMILY GENTIANACEÆ.]

[GENUS GENTIANA, LINN.

Gentiana gracilifolia, *Cheesem. Man. N.Z. Fl.* 1114.

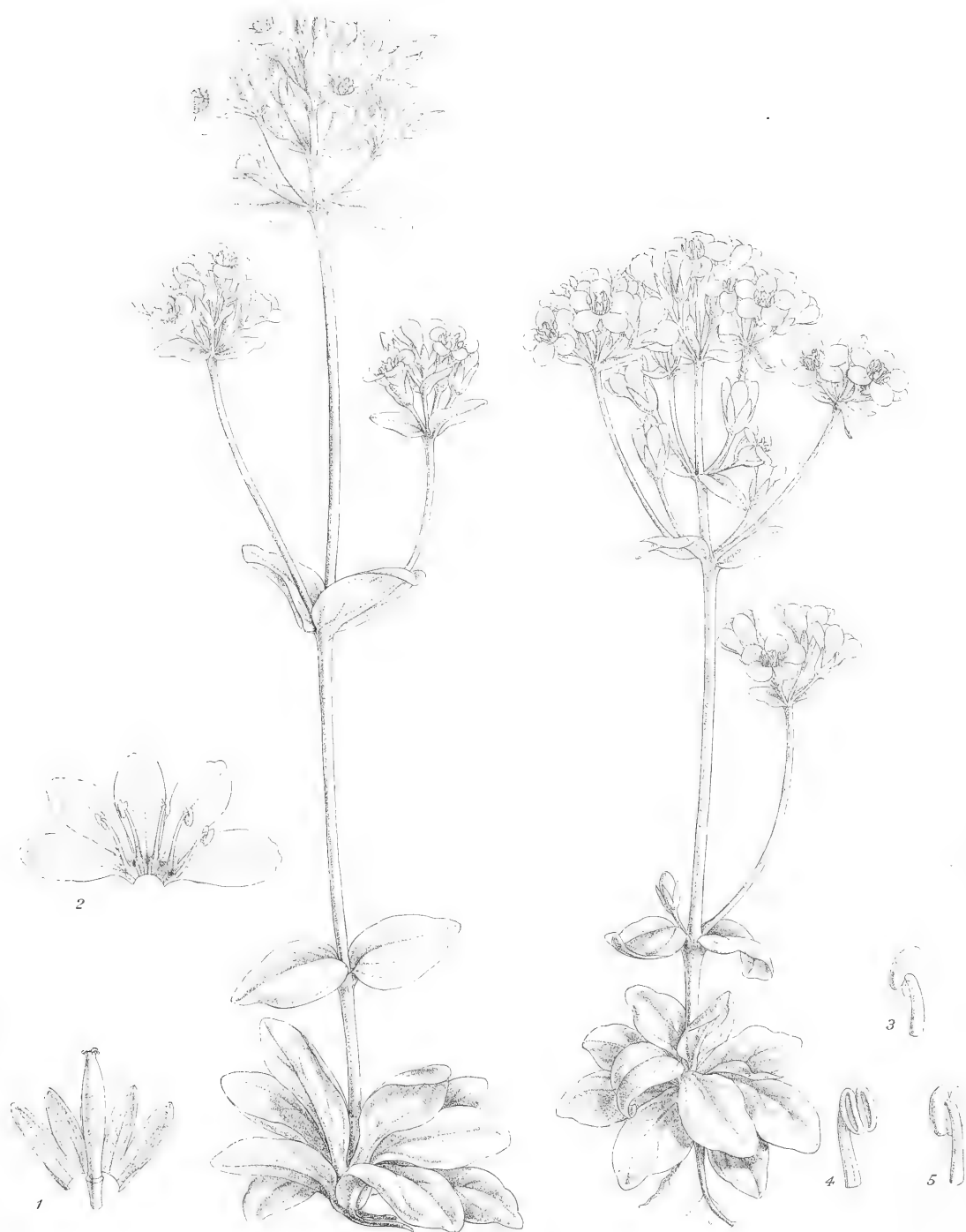
The New Zealand Gentians form a very beautiful and attractive group of plants. Those who have wandered over the alpine valleys and slopes of the southern portion of the Dominion, and have seen the dazzling display of flowers in such species as *G. corymbifera*, *G. Townsoni*, *G. montana*, *G. patula*, *G. bellidifolia*, and *G. cerina*, will readily admit that among the montane herbaceous plants of the Dominion there are few genera which present such a peculiarly charming and graceful appearance. It is true that as a rule the flowers are white, as is the case with most New Zealand alpine, and never show the deep intense blue which lends such a fascination to many of the northern species; yet even then our species have many special attractions of their own, and will always claim the admiration of any observer of nature.

G. gracilifolia, although not an unattractive plant, has not the large flowers of several of its allies. It was first observed by myself on the Mount Arthur Plateau, Nelson, in January, 1881, and again in 1887, but on both occasions my visit was too early in the season to permit me to obtain fully expanded flowers. In the autumn of 1905, however, Mr. F. G. Gibbs examined the locality at my request, and was successful in securing an ample supply of specimens, from which the accompanying plate has been prepared. So far, I am not aware that it has been found in any other locality; but it probably extends northwards along the Mount Arthur Range to the high mountainous country at the back of Collingwood. The altitude at which my specimens were gathered was a little under 4,000 ft.

On the Mount Arthur Plateau *G. gracilifolia* occurs in peaty localities by the margins of small tarns, in situations so wet that water can be squeezed out of the peat in which the plant grows. It is associated with such species as *Carex Gaudichaudiana* and *G. echinata*, *Oreobolus pumilio*, *Scirpus aucklandicus*, *Centrolepis viridis*, *Bulbinella Hookeri*, *Herpoticirion novae-zelandiae*, *Cyathodes empetrifolia*, *Dacrydium Bidwillii* and *D. laxifolium*, &c. Unlike most of the New Zealand species, it is much branched and densely leafy at the base, forming compact sward-like patches 4 in. to 6 in. in diameter. The leaves are dark green when fresh, but blackish-brown when dried, uniform in shape and size, and about $\frac{1}{2}$ in. to $\frac{2}{3}$ in. long. There are 2 to 4 pairs of cauline leaves, and 2 to 4 flowers to each stem; the corolla being pure white, and about $\frac{1}{2}$ in. to $\frac{1}{2}$ in. diameter.

As a species *G. gracilifolia* is perhaps more nearly allied to *G. Townsoni* than to any other, but can be readily distinguished by its much smaller size and by often forming a compact sward, by the smaller and narrower leaves, and by the much smaller and fewer flowers.

PLATE 137. *Gentiana gracilifolia*, drawn from specimens gathered by Mr. F. G. Gibbs on the Mount Arthur Plateau, Nelson, at an altitude of nearly 4,000 ft. Fig. 1, leaf ($\times 2$); 2, base of leaf, showing scale-like appendages ($\times 6$); 3, calyx spread open, with ovary ($\times 2$); 4, corolla laid open ($\times 2$); 5 and 6, front and back view of anthers from a fully expanded flower ($\times 8$); 7, anther from a bud ($\times 8$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp

GENTIANA CHATHAMICA, *Cheesem.*

PLATE 138.—GENTIANA CHATHAMICA.

FAMILY GENTIANACEÆ.]

[GENUS GENTIANA, LINN.]

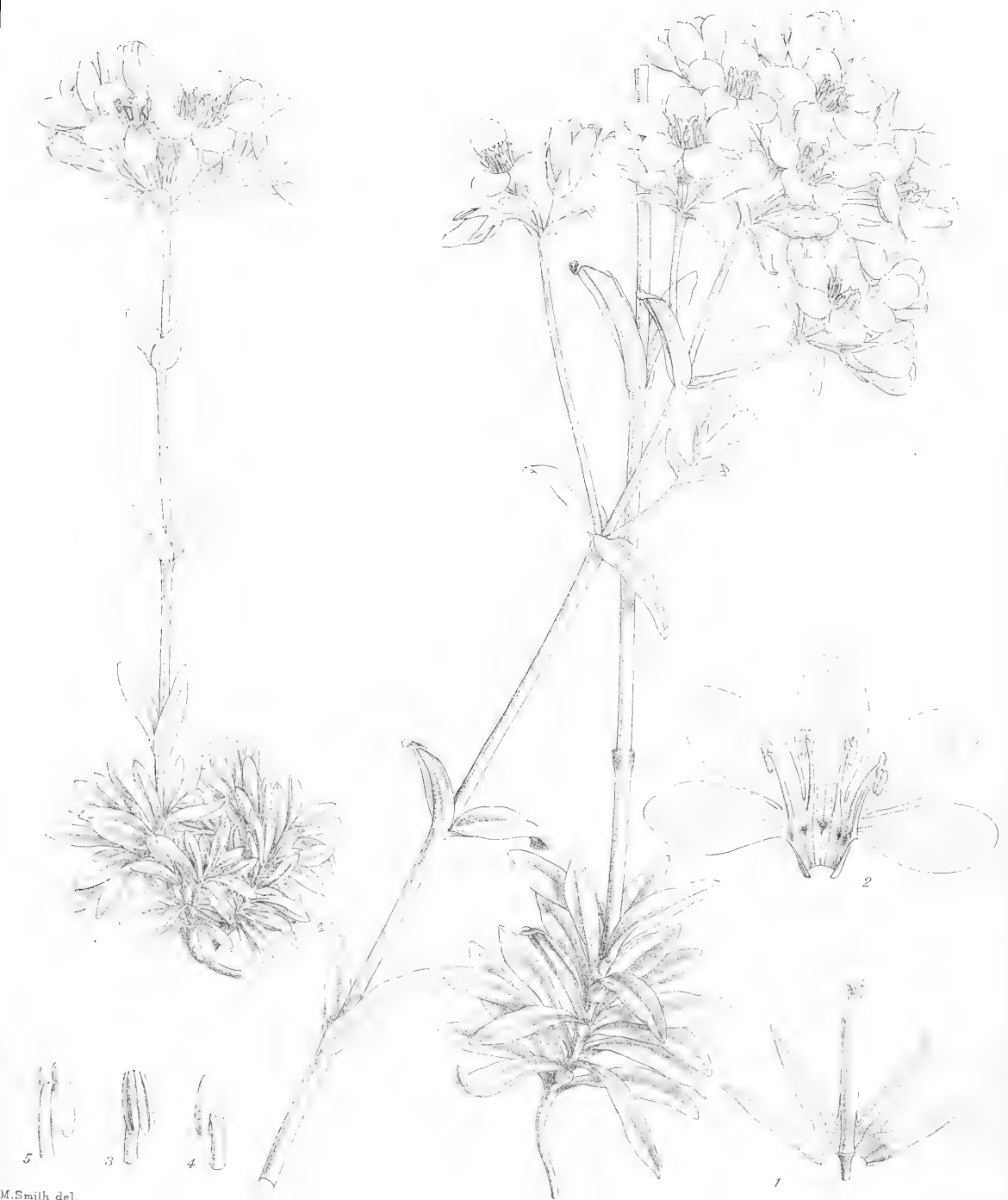
Gentiana chathamica, *Cheesem. Man. N.Z. Fl.* 449.

Gentiana chathamica was discovered by Mr. H. H. Travers during his first visit to the Chatham Islands in 1863. The plants collected on that occasion were placed in the hands of Baron Mueller for determination, and were reported upon in his little book on the vegetation of the Chatham Islands, published in 1864. He referred Mr. Travers's specimens to Forster's *G. saxosa*; but then he included in that species all the Gentians found in Australia and New Zealand, and, with one exception, all those known from the southern part of South America! It is perhaps hardly necessary to say that these extreme views have found no supporters. The plant was also gathered by Mr. Travers in his second visit in 1871, and was placed by Mr. Buchanan in *G. pleurogynoides*. Mr. Kirk, in his "Revision of the New Zealand Gentians" (*Trans. N.Z. Inst.* xxvii (1895), 335), also referred it to *G. pleurogynoides*, but as a separate variety, to which he gave the name of var. *umbellata*. While preparing my "Manual of the New Zealand Flora" I received many excellent specimens of the Chatham Islands plant from Mr. Cox, proving beyond all question that it constituted a perfectly distinct species, and I therefore described it under the name of *G. chathamica*.

G. chathamica is an annual species from 6 in. to 12 in. high. Usually the stems are simple and erect, but occasionally there may be two or three weaker branches springing from the base and usually decumbent below. The radical leaves are often numerous and more or less rosulate, and vary in shape from oblong-spathulate to broadly oblong. They are much thinner than is usual in the New Zealand species. The flowers are white, or white streaked with pink, and are arranged in 3–12-flowered umbels terminating the stem and its branches. The peculiar habit, small broad and thin leaves, and small umbellate flowers with a deeply divided calyx and corolla are the best marks of the species.

According to Mr. Cox, *Gentiana chathamica* is not uncommon on the Chatham Islands, usually in peaty swamps, but also in fairly dry situations. Baron Mueller says that it is found "on fern or grass land or peaty soil." Dr. Cockayne, in his interesting memoir on "The Plant Covering of Chatham Islands" (*Trans. N.Z. Inst.* xxxiv (1902), 242–325), mentions it as occurring in heath-like situations, in the *Lepyrodia-Olearia* bog, and on the dry ridges of the tableland. From the above it is evident that the plant has a somewhat wide range of habitats.

PLATE 138. *Gentiana chathamica*, drawn from specimens collected by Mr. F. A. D. Cox in the Chatham Islands. Fig. 1, calyx laid open and ovary ($\times 3$); 2, corolla laid open ($\times 3$); 3, anther taken from a bud ($\times 6$); 4 and 5, front and back view of anther from fully expanded flower ($\times 6$).



M. Smith del.
J. N. Fitch lith.

GENTIANA TOWNSONII, *Cheesem.*

West, Newman imp

PLATE 139.—GENTIANA TOWNSONI.

FAMILY GENTIANACEÆ.]

[GENUS GENTIANA, LINN.

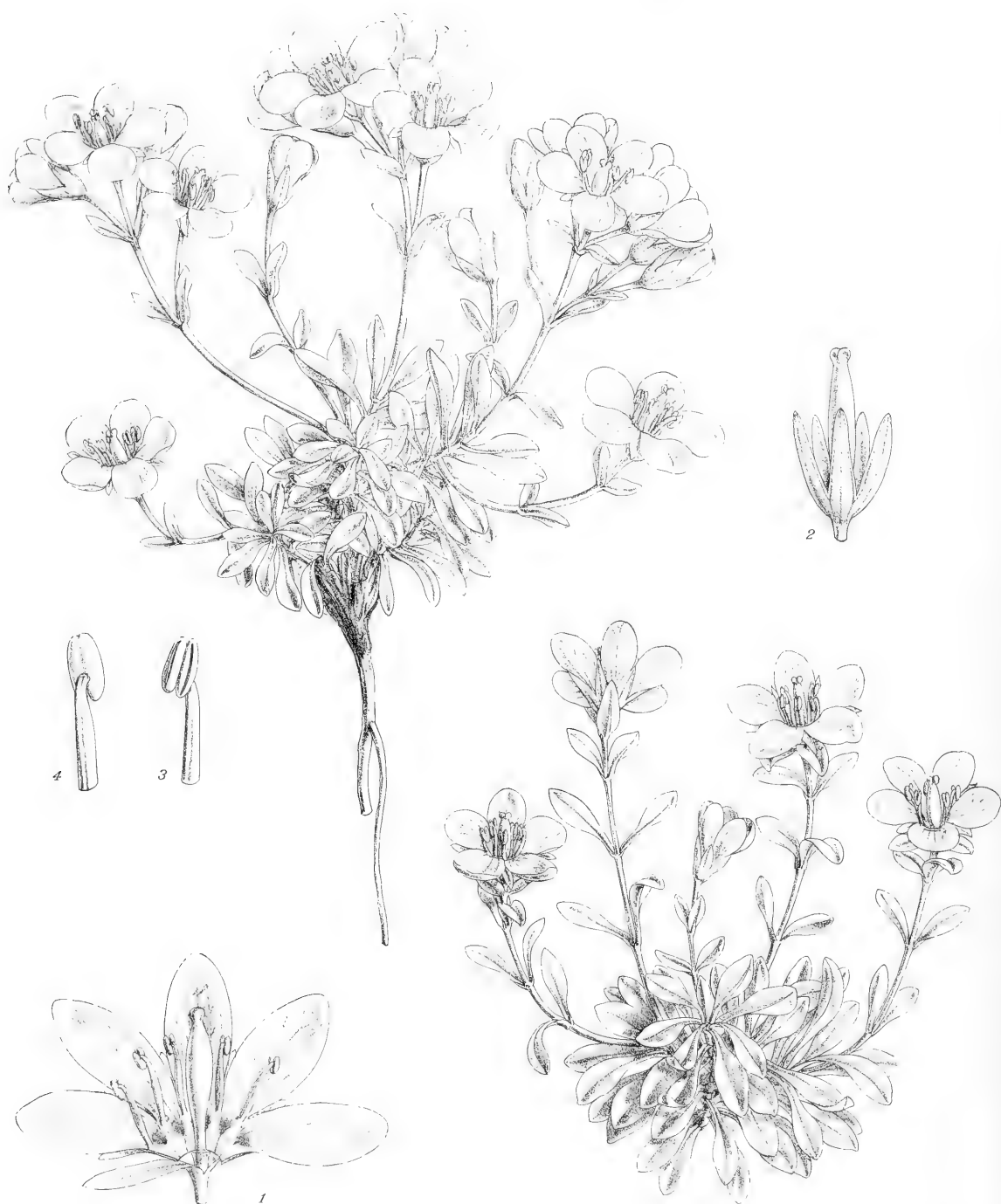
Gentiana Townsoni, *Cheesem. Man. N.Z. Fl.* 450.

Situated on the coast-line of north-west Nelson, and flanking the Papahua and Paparoa Mountains, are long stretches of somewhat dreary swampy plains locally known as "pakihis." Some of these descend almost to sea-level; others reach a considerable height on the sides of the mountains. Much of their surface is so wet as to form veritable swamps, in which *Typha*, several species of *Cladium* and *Carex*, *Carpha*, and other swamp-plants form the chief vegetation. In drier places they are usually covered with *Leptospermum*, mixed with such plants as *Pteris aquilina*, *Gleichenia circinata*, *Epacris pauciflora*, many orchids, *Anagosperma dispermum*, *Actinotus*, and others. It is in this locality that the subject of this plate is commonly found.

G. Townsoni, which well commemorates its energetic discoverer, must be considered to be one of the most beautiful species of the genus in New Zealand. Speaking of it, Mr. Townson says, "It grows in the most open and exposed situations, and many plants may often be seen clustered together. As several stems generally arise from one root, each crowned with its umbel of large white flowers, a patch of these Gentians forms a veritable beauty-spot upon the uniformly dreary surface of these bog-lands." Its tall slender habit and numerous small ovate-lanceolate or trowel-shaped leaves give it a very different appearance from any of its allies. *G. corymbifera* is easily distinguished by its stout and almost naked stems, and much longer and proportionately narrower rosulate radical leaves; while *G. montana* has larger obovate-spathulate radical leaves, and broadly ovate cauline leaves, cordate at the base.

So far I have seen no specimens but Mr. Townson's, from which this plate has been prepared. But so little is known of the vegetation of Westland that I can entertain no doubt that it extends southwards along the western side of the South Island. Mr. N. E. Brown informs me that specimens collected by Lyall are in the Kew Herbarium; probably these would be obtained in the Sounds of the south-west coast of Otago.

PLATE 139. *Gentiana Townsoni*, drawn from specimens collected by Mr. W. Townson in the vicinity of Westport. Fig. 1, calyx laid open, showing ovary ($\times 3$); 2, corolla laid open ($\times 3$); 3 and 4, front and back view of anther taken from the bud ($\times 6$); 5, anther taken from a fully expanded flower ($\times 6$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

GENTIANA BELLIDIFOLIA, Hook f.

PLATE 140.—GENTIANA BELLIDIFOLIA.

FAMILY GENTIANACEÆ.]

[GENUS GENTIANA, LINN.

Gentiana bellidifolia, Hook. f. in Hook. Ic. Plant. t. 635; Cheesem. Man. N.Z. Fl. 452.

Under Plates 114 (*Senecio Bidwillii*), 127 (*Epacris alpina*), and 131 (*Dracophyllum recurvum*) I have figured some well-known subalpine plants discovered by Mr. J. C. Bidwill in his adventurous expedition to the central volcanic plateau of the North Island in 1839. The present plate represents another of his discoveries, and by no means the least interesting. Like the three others, it was collected on or near the slopes of Ngauruhoe, which he was the first European to ascend. Mr. Colenso, in his first ascent of the Ruahine Mountains in 1845, was the next to gather the plant; and since then it has been observed by all visitors to the higher mountains of both the North and the South Islands. Its northern limit is on Mount Hikurangi, in the East Cape district, from whence it extends southwards almost as far as Foveaux Strait. Its altitudinal range is from 2,000 ft. to 5,000 ft.

G. bellidifolia was originally published under its present name by Sir J. D. Hooker in the "Icones Plantarum" (t. 635). The plate represents a small state with single-flowered branches, but otherwise is an excellent representation of the species. In the "Flora Novæ Zelandiæ" Hooker reduced all the New Zealand and Australian forms of the genus (saving only the Auckland Islands species) to Forster's *G. montana* and *G. saxosa*, placing *G. bellidifolia* under the latter. Benthams, in the "Flora Australiensis," went still further, merging both *G. montana* and *G. saxosa*; and this course was also adopted by Baron Mueller. No doubt the fact that Hooker and Benthams were dealing solely with dried specimens will account for a step which every field botanist in New Zealand finds himself unable to agree with. That Hooker would have acted differently had he actually seen the alpine vegetation of the Dominion may be inferred from the fact that when he visited the Auckland Islands, where he was able to observe and draw the species on the spot, he recognized the distinctness of *G. cerina* and *G. concinna*, which are much nearer together, and much more closely allied to the true *G. saxosa* than most of the forms placed by him under that plant. It was not until 1895, when Mr. Kirk published his "Revision of the New Zealand Gentians" (Trans. N.Z. Inst. xxvii (1895), 330), that an attempt was made to separate some of the numerous species which until then had been huddled together.

Gentiana bellidifolia, which I have had frequent opportunities of observing, both in the North and South Islands, is a small perennial herb with numerous densely compacted stems 2 in. to 6 in. high, and furnished at the base with rosettes of spatulate leaves of a dull brownish-green colour. The flowers are terminal, solitary or in 2-6-flowered cymes, and large for the size of the plant, being sometimes nearly an inch in diameter. In colour they are generally white, but are frequently furnished with slender purple lines. As a species it is nearest to my *G. patula*, but that plant is ordinarily much taller, with longer leaves, and the flowers are much more numerous. *G. discisa* differs in being excessively branched from the root, thus forming hemispherical masses 2 in. to 6 in. in diameter, often wholly covered with flowers. The remaining species do not appear to be at all closely allied.

PLATE 140. *Gentiana bellidifolia*, drawn from specimens collected by Mr. H. Hill on the Ruahine Mountains, at an altitude of 4,000 ft. Fig. 1, flower laid open ($\times 2\frac{1}{2}$); 2, calyx and ovary ($\times 2\frac{1}{2}$); 3 and 4, stamens ($\times 5$).



M. Smith del.
J. N. Fitch lith

West, Newman imp.

GENTIANA SPENCERI, *T. Kirk.*

PLATE 141.—GENTIANA SPENCERI.

FAMILY GENTIANACEÆ.]

[GENUS GENTIANA, LINN.

Gentiana Spenceri, T. Kirk in *Trans. N.Z. Inst.* xxvii (1895), 335; *Cheesem. Man. N.Z.* Fl. 453.

Gentiana Spenceri was named in recognition of the botanical services of the Rev. F. R. Spencer, who for many years has collected plants in both the North and South Islands, and particularly on the central volcanic plateau of the North Island. It was first gathered by him on Mount Rochfort, near Westport, in the year 1880, and was communicated to Mr. T. Kirk, who, however, did not publish it until the appearance of his "Revision of the New Zealand Gentians" in 1895. Since then Mr. Townson, who has so carefully explored the Westport district, has found it to be plentiful in many localities on the Paparoa and Papahua Mountains, from Mount Faraday northwards to Mount Stormy, near the mouth of the Karamea River. From thence it almost certainly stretches still further north in the direction of Collingwood, for it has been recently gathered by Mr. F. G. Gibbs in the Cobb Valley, near Mount Arthur. It thus appears to be mainly a plant of western Nelson, possibly extending southwards into Westland. According to Mr. Townson, its altitudinal range is from 1,500 ft. to 3,500 ft.

G. Spenceri is a well-marked and perfectly distinct plant, not at all closely allied to the other New Zealand species. It can always be distinguished by the erect slender habit, numerous rosulate obovate-spathulate radical leaves, few cauline leaves, and particularly by the involucrate umbels and small flowers, the corolla of which is not much longer than the calyx. The flowers are sometimes white, but more often, according to Mr. Townson, white streaked with numerous purple veins. The same observer informs me that it is usually found among scrub, in this respect differing from *G. Townsoni*, *G. montana*, and *G. bellidifolia*, which are plentiful in the same district, but which nearly always occur in open or even decidedly exposed situations.

No portion of the Dominion is richer in Gentians than north-west Nelson, including in the term the district stretching from Collingwood to Mount Arthur, Mount Owen, and thence to the southern termination of the Paparoa Mountains. Within these limits the following species occur: *G. filipes*, *G. gracilifolia*, *G. corymbifera*, *G. Townsoni*, *G. montana*, *G. vernicosa*, *G. patula*, *G. bellidifolia*, *G. divisa*, *G. Spenceri*, and *G. saxosa*. Of these eleven species no less than five have not been found elsewhere, as follows: *G. filipes*, *G. gracilifolia*, *G. Townsoni*, *G. vernicosa*, and *G. Spenceri*. The north-west portion of the South Island may therefore claim to be the centre of distribution of the genus in New Zealand.

PLATE 141. *Gentiana Spenceri*, drawn from specimens collected by Mr. W. Townson on Mount Rochfort, Nelson, at an altitude of 3,500 ft. Fig. 1, calyx and ovary ($\times 2$); 2, corolla laid open ($\times 2$); 3 and 4, front and back view of anthers ($\times 5$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

MYOSOTIS FOSTERI, *Lehm.*

PLATE 142.—MYOSOTIS FORSTERI.

FAMILY BORAGINACEÆ.]

[GENUS MYOSOTIS, LINN.

Myosotis Forsteri, *Lehm. Asperif.* 95; *Hook. f. Handb. N.Z. Fl.* 194; *Cheesem. Man. N.Z. Fl.* 463.

The genus *Myosotis* is probably better represented in New Zealand than in any other country, no less than twenty-six species being now known to inhabit it. Of these, about one-half belong to the typical portion of the genus, in which the stamens are inserted on the corolla-tube, the filaments being so short that the tips of the anthers barely exceed the corolla-scales, or are below their level. The remainder of the species fall into the section *Exarrhena* (often kept as a distinct genus), which has the stamens inserted between the corolla-scales, the anthers being produced beyond them, and sometimes overtopping the corolla-lobes.

M. Forsteri, which is a typical *Myosotis*, was first gathered by Banks and Solander in Cook's first voyage. They appear to have met with it in most of the localities visited by them, for in Solander's manuscripts it is recorded from "Tigadu, Tolago, Opuragi, Motuaro, and Totaranui." Whether it was also gathered by Forster in Cook's second voyage is not so certain, although most probable. The species was described by Lehmann in 1818 under Forster's name, which would seem to imply that Forster had collected it; but, on the other hand, the only species mentioned in Forster's "Prodromus" is *M. spathulata*, which differs greatly in the structure of the flower. Probably, as suggested by Alphonse de Candolle (*Prodr.* x, 110), it was mixed with that species in Forster's collections, and was overlooked until Lehmann's time. This view is rendered more probable by the fact that A. Richard, in his "Flore de la Nouvelle Zélande," described undoubted specimens of *M. Forsteri*, collected by D'Urville a little to the north of Nelson, under the name of *M. spathulata*. Richard had full access to Forster's plants, and was no doubt misled by both the species being mixed together. As soon as the botanical investigation of the Dominion was taken in hand by resident observers *M. Forsteri* was found to have a fairly general distribution from the Bay of Islands southwards to the west of Otago, although it appears to be local on the eastern side of the South Island.

M. Forsteri is usually found by the sides of streams, either in hilly and wooded districts or in open swampy forests. As a species it is distinguished by its weak and diffuse habit, the stems being usually decumbent, but ascending or suberect above. The leaves are oblong or oblong-orbicular, and rounded at both ends. The flowers, which are white or white with a yellow eye, are arranged in long and slender many-flowered racemes, the lower flowers often being axillary. The nutlets are broadly ovoid, pale shining brown. Its nearest ally is *M. australis*; but that species is more erect and much more hispid; the pedicels are more erect, the flowers are generally yellow; and the nutlets are narrower and always black when fully ripe.

PLATE 142. *Myosotis Forsteri*, drawn from specimens collected by the Patea River, near Stratford, Taranaki. Fig. 1, small portion of leaf, showing the bristly hairs ($\times 3$); 2, flower ($\times 6$); 3, calyx laid open ($\times 8$); 4, corolla laid open ($\times 8$); 5 and 6, front and back view of anther ($\times 12$); 7, ovary and style ($\times 15$); 8, ripe fruit ($\times 8$); 9, nutlet ($\times 8$).



M. Smith del.
J. N. Pritch lith.

West, Newman imp.

MYOSOTIS EXPLANATA, *Cheesem.*

PLATE 143.—MYOSOTIS EXPLANATA.

FAMILY BORAGINACEÆ.]

[GENUS MYOSOTIS, LINN.

Myosotis explanata, *Cheesem. Man. N.Z. Fl.* 461.

It is one of the peculiarities of the genus *Myosotis* that species which differ essentially in their floral characters may have foliage so very similar in size, shape, and in the character of their indumentum as to make it a matter of extreme difficulty to distinguish them when flowers are not available. The plant illustrated in this plate is a case in point, for it and four other species—*M. capitata*, *M. albida*, *M. concinna*, and *M. macrantha*—which have entirely distinct flowers, have leaves so very similar as to make it quite easy to confound them in a flowerless condition. In like manner, *M. Forsteri* and *M. petiolata* closely resemble one another in foliage, but have very diverse flowers; and *M. Traversii* and *M. angustata* are in very much the same position. It is this peculiarity which has led to several really distinct species being confused together until quite recent years.

M. explanata was originally discovered by myself on the mountains overlooking Arthur's Pass, Canterbury, in January, 1880. Since then I have twice observed it in the same locality, and it has also been gathered on the adjacent Walker's Pass by Dr. Cockayne, these being all the localities I am acquainted with. Its altitudinal range, as noted by myself, is from 3,000 ft. to 4,500 ft. It is usually found in sheltered nooks and corners at the base of masses of rock or of rock pillars.

M. explanata is most nearly allied to *M. capitata*, from which, however, it can be distinguished by the more membranous and less hairy leaves, by the large pure-white flowers, which are almost double the size of the blue flowers of *M. capitata*, and in the larger calyx. The position of the stamens with regard to the scales on the throat of the corolla is very much the same in both species. *M. albida* can be recognized by its larger size and coarser habit, and in the anthers being above the level of the corolla-scales, whereas they are below in *M. explanata* and *M. capitata*.

PLATE 143. *Myosotis explanata*, drawn from specimens collected on Arthur's Pass, Canterbury Alps, at an altitude of 3,500 ft. Fig. 1, flower ($\times 2$); 2, section of calyx, showing ovary and style ($\times 3$); 3, corolla laid open ($\times 3$); 4 and 5, front and back view of anthers ($\times 6$); 6 and 7, nutlet ($\times 6$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

MYOSOTIS MONROI, *Cheesem.*

PLATE 144.—MYOSOTIS MONROI.

FAMILY BORAGINACEÆ.]

[GENUS MYOSOTIS, LINN.

Myosotis Monroi, *Cheesem. Man. N.Z. Fl.* 469.

This attractive little plant was originally discovered by Sir David Monro about the year 1854 on Dun Mountain, Nelson. Specimens forwarded at that time to Kew were referred by Sir J. D. Hooker to the little-known *M. saxosa*, an obscure plant gathered by Colenso on the summit of Titikura, Hawke's Bay, and which has not since been met with. Monro's plant, however, has proved to be comparatively abundant on the Dun Mountain Range, and has been gathered by most New Zealand botanists, and among them Travers, Hector, Buchanan, Kirk, and myself. Up to the present time, however, it has not been found in any other district, and is apparently confined to the Dun Mountain Range and its southern continuation as far as the Red Hills, in the Wairau Valley, a distance of about thirty-five miles. Its altitudinal range is from 3,000 ft. to 4,500 ft.

For many years I entertained suspicions that the Dun Mountain plant was different from that discovered on Titikura by Colenso; but, as all attempts to find the latter proved abortive, no positive conclusions could be arrived at. Knowing that Colenso's types were at Kew, I applied to Mr. N. E. Brown, of the Kew Herbarium, asking him to compare specimens of the two plants. As he reported that they were clearly and absolutely distinct, I described the Nelson plant as a separate species in the Manual, applying to it the name of its discoverer.

M. Monroi belongs to the section *Exarrhena*, in which the anthers extend far above the corolla-tube. As a species it is well marked by its comparatively small size and slender habit; by the rather narrow lanceolate-spathulate leaves, hispid above with short white hairs, but often almost glabrous beneath; by the many-flowered racemes of bright-yellow flowers; by the linear acute calyx-lobes and funnel-shaped corolla; and by the stamens equalling or even slightly exceeding the corolla-lobes. Judging from the description given by Hooker in the "Flora," *M. saxosa* differs in its shorter and stouter habit, in the broader leaves very densely hispid with long soft hairs, and in the few-flowered racemes of white flowers.

PLATE 144. *Myosotis Monroi*, drawn from specimens gathered by Mr. F. G. Gibbs on Dun Mountain, Nelson, at an altitude of nearly 4,000 ft. Fig. 1, flower ($\times 3$); 2, section of calyx, showing ovary and style ($\times 4$); 3, corolla laid open ($\times 4$); 4, ripe fruit ($\times 6$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

MYOSOTIS CONCINNA, *Cheesem.*

PLATE 145.—MYOSOTIS CONCINNA.

FAMILY BORAGINACEÆ.]

[GENUS MYOSOTIS, LINN.

Myosotis concinna, Cheesem. in *Trans. N.Z. Inst.*, xvii (1885), 235; *Cheesem. Man. N.Z. Fl.* 170.

Myosotis concinna, which is undoubtedly one of the most beautiful species of the genus, was discovered by myself in January, 1882, on the northern slopes of Mount Owen, a broad and massive many-peaked mountain situated between the Buller Valley and the headwaters of the Wangapeka River. I reached the locality by following up the Rolling River from its junction with the Wangapeka, and then gradually ascending, first through *Fagus* forest, and then through the densest of subalpine scrub, in which *Senecio laxifolius* was more abundant than in any other locality known to me, to the open elevated rocky country surrounding the higher peaks of the mountain. In this locality, which varies in altitude from 3,500 ft. to 5,000 ft., *M. concinna* was a very abundant and conspicuous species, its bright-yellow flowers showing in every nook and corner, and filling the surrounding air with their fragrance. Associated with it were many other interesting alpine plants, among which may be mentioned *Ranunculus insignis* and *R. geraniifolius*, *Ligusticum piliferum*, *Aciphylla Lyallii* var. *crenulata*, *Brachycome Sinclairii*, *Celmisia incana*, *Craspedia uniflora* var. *lanata* (very plentiful), *Colobanthus canaliculatus*, and *Poranthra alpina*.

In 1902 Mr. W. Townson examined the southern slopes of Mount Owen, or the opposite side to that visited by me. He also found *M. concinna* exceedingly plentiful, remarking that it and *Epilobium vernicosum* formed the most striking feature in the vegetation of the mountain. So far as I am aware, the typical form of the species has been found nowhere but on Mount Owen; but in 1886 I gathered a plant on Mount Arthur which agrees in habit, foliage, and shape of corolla, but differs in the flowers being white with a yellow eye, and not pure yellow, as is the case with the type.

M. concinna is a remarkably distinct species, especially in its floral characters. Its radical leaves are numerous and tufted, lanceolate-spathulate in shape, and densely clothed with fine silky appressed hairs. Springing from among the leaves are numerous ascending or erect flowering-stems 6 in. to 15 in. high, each furnished with many-flowered simple or forked racemes of bright-yellow sweet-scented flowers. The corolla can be described as funnel-shaped with a short tube and large deeply divided limb. The stamens have slender elongated filaments, so that the anthers are exserted beyond the corolla-lobes.

The beauty and fragrance of the flowers suggest its cultivation in gardens, but so far no attempt has been made to introduce it, probably on account of the somewhat difficult nature of its habitats. *M. macrantha* is an even still more beautiful plant, with large, deliciously fragrant brownish-orange flowers, with a long tube and small limb. I would also commend to the notice of horticulturists the Auckland Islands *M. capitata*, with its azure-blue flowers; the white-flowered *M. albida* and *M. explanata*; and also *M. petiolata*, which has white flowers with a yellow eye.

PLATE 145. *Myosotis concinna*, drawn from specimens collected on Mount Owen, Nelson, at an altitude of 4,500 ft. Fig. 1, flower ($\times 3$); 2, section of calyx, showing ovary and style ($\times 3$); 3, corolla laid open ($\times 3$); 4 and 5, front and back view of anthers ($\times 6$); 6, fruit ($\times 4$); 7, single nutlet ($\times 4$).



M. Smith del.
J.M. Fitch lith.

West, Newman imp.

MYOSOTIDIUM NOBILE, Hook.

PLATE 146.—MYOSOTIDIUM NOBILE.

FAMILY BORAGINACEÆ.]

[GENUS MYOSOTIDIUM, Hook.

Myosotidium nobile, Hook. Bot. Mag. t. 5137; Cheesem. Man. N.Z. Fl. 472.

Myosotidium nobile, or the "Chatham Islands lily," as it is often absurdly called, is from a scientific point of view the most interesting plant found on the Chatham Islands. Its peculiar habit and appearance, so widely different from that of other members of the *Boraginaceæ*; its beauty as a garden-plant; and, above all, the remarkable fact that such a distinct genus should be confined to the tiny group of the Chatham Islands, where it is far removed from any near allies, and where no key exists as to its pedigree and past development; are facts which necessarily involve many questions of importance. We are led to inquire how its presence and that of other endemic plants can be best explained; what changes in the past geography of the islands seem to be indicated, and at what geological period; and what bearing such considerations have on the previous history of the New Zealand flora as a whole.

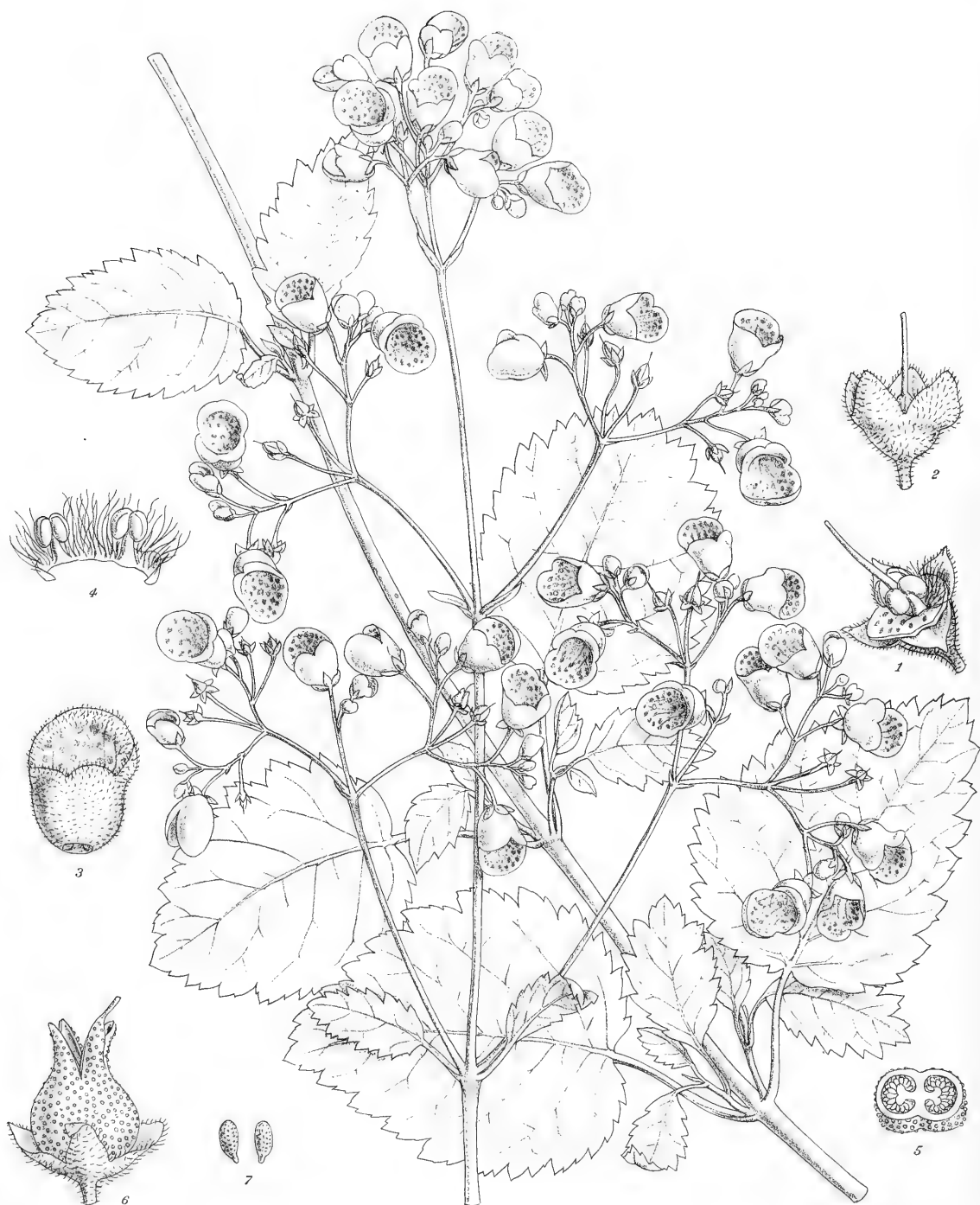
Myosotidium first became known through specimens cultivated in England, and was originally described by Sir J. D. Hooker under the name of *Cynoglossum nobile* "Gardener's Chronicle," 1858, p. 240). It soon became apparent, however, that it constituted a separate genus, and in 1859 it was described and figured as such in the "Botanical Magazine" (t. 5137). The first botanist to collect *Myosotidium* in its native habitat was Mr. H. H. Travers, who visited the Chathams in 1863 for the purpose of examining the vegetation, which up to that time was only known through a few plants collected by Dieffenbach in 1840. Baron Mueller's little book on the "Vegetation of Chatham Islands," which was based on Mr. Travers's collections, contains an excellent detailed description of the plant. Since that time it has been observed by most visitors to the group, and has also become well known in cultivation in the Dominion.

All old residents of the Chatham Islands agree in stating that *Myosotidium* was originally an abundant coastal plant, usually growing in sandy soil just above high-water mark. The late Mr. A. Shand, so well known from his researches into the language and traditional history of the Moriori race, assured me that in several localities it once formed an unbroken line for miles together on the seashore; and the veteran botanist of the islands, Mr. F. A. D. Cox, makes a similar statement. Mr. H. H. Travers, speaking of the coast-line near Waitangi, says, "On the beach the *Myosotidium nobile* grew with rank luxuriance where not invaded by the pigs, which fed upon the roots" (Trans. N.Z. Inst. i (1869), 176). At the present time, however, it has become rare in the wild state, and only exists in a few scattered localities, which are gradually becoming fewer in number. Its decrease is due partly to sheep, which feed on the leaves, and partly, as mentioned above, to the attacks of pigs, which root up the stout fleshy rhizomes.

Myosotidium is a stout succulent herb 1 ft. to 3 ft. high, with a thick and fleshy rhizome sometimes as much as 2 in. in diameter. The broad dark-green leaves are remarkably thick and succulent, and vary from 6 in. to 15 in. in diameter. They are strongly ribbed beneath and channelled above, and the stout petiole is also grooved in front. The flowering-stem is often more than 2 ft. in height, and bears a dense corymbose cyme 6 in. to 9 in. across. The flowers are about $\frac{1}{2}$ in. in diameter, bright blue towards the centre, but fading to white towards the margin. The fruit is thick and spongy, pyramidal and four-winged, and from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. in diameter.

It requires a little care to cultivate *Myosotidium* successfully. It can be reared from seeds without the slightest difficulty, but to grow it to maturity and flower it regularly a special border is requisite. This should be made of sand and peaty loam, and the drainage should be absolutely free. A certain amount of shade is necessary, and abundance of moisture should be provided. If the above steps are taken the plant can usually be established, and may be flowered for many years in succession. A white-flowered variety is perhaps even more ornamental than the type.

PLATE 146. *Myosotidium nobile*, drawn from specimens cultivated in the garden of the late Mr. H. J. Matthews, Dunedin. Fig. 1, flower just previous to expansion ($\times 2$); 2, calyx, the corolla being removed ($\times 3$); 3, section of corolla ($\times 3$); 4, anther ($\times 6$); 5, nutlet ($\times 1\frac{1}{2}$); 6, seed ($\times 2$); 7, embryo ($\times 2$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

CALCEOLARIA SINCLAIRII, Hook.

PLATE 147.—*CALCEOLARIA SINCLAIRII*.

FAMILY SCROPHULARIACEÆ.]

[GENUS *CALCEOLARIA*, LINN.]

Calceolaria Sinclairii, Hook. Ic. Plant. t. 561 : Cheesem. Man. N.Z. Fl. 483.

Calceolaria Sinclairii, as its name denotes, is one of the discoveries of Dr. Andrew Sinclair, who between the years 1841 and 1861 paid special attention to the botany of New Zealand, and formed large collections. Most of these were transmitted to Kew, and constituted no small part of the material upon which Sir J. D. Hooker founded his "Flora Novæ Zelandiæ" and the later-issued "Handbook." The first-mentioned publication was in fact dedicated to Mr. Colenso, Dr. Sinclair, and Dr. Lyall, as a "work which owes so much to their indefatigable exertions."

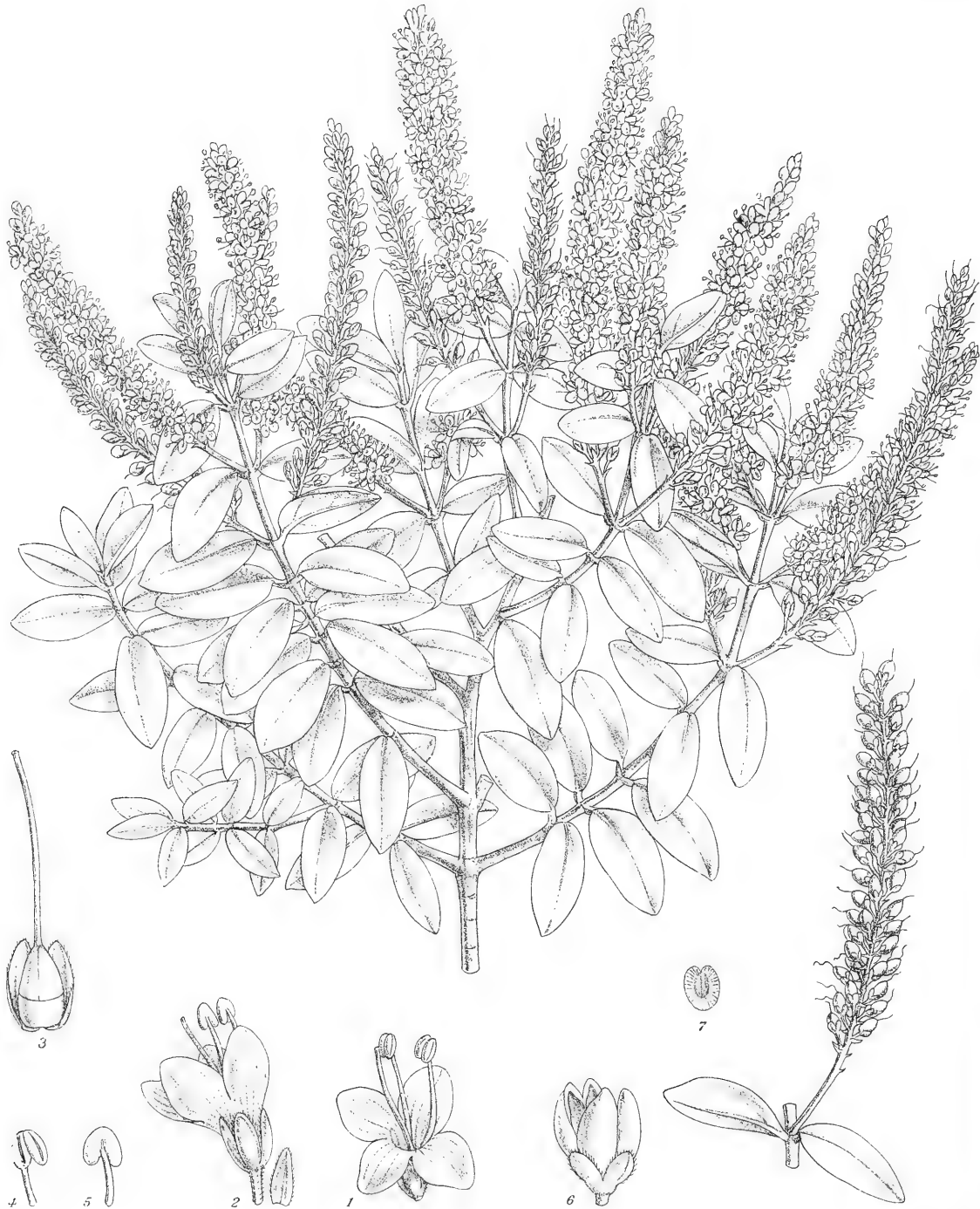
According to the "Icones Plantarum," in which our plant was first figured and described, Dr. Sinclair collected it in 1842 at "Waihake, in the Northern Island of New Zealand"; but in the "Flora" the locality is simply given as the East Cape. By "Waihake" is probably meant Waikaka, near the mouth of the Waipatu River, a district which in those days possessed a large Maori population and a considerable trade. About the same time, or a little later, it was also gathered by Mr. Colenso, both in Hawke's Bay and in the East Cape district. It is now known to extend southwards from Hicks Bay and the East Cape to Hawke's Bay and the eastern base of the Ruahine Mountains.

Calceolaria Sinclairii is a laxly branched herbaceous or almost suffruticose erect plant 6 in. to 18 in. high, more or less glandular-pubescent in all its parts. It has opposite leaves on long slender petioles, the blade being coarsely doubly serrate, and varying from 1 in. to 3 in. in length. The inflorescence is composed of terminal many-flowered panicles far exceeding the leaves, and the flowers are small, white or yellow spotted with purple, and from $\frac{1}{4}$ in. to $\frac{1}{3}$ in. diameter. The corolla is divided into two unequal concave lips, the upper lip being distinctly but slightly smaller, and shallowly 2-lobed; the under entire or very obscurely 3-lobed.

I have retained the circumscription of *Calceolaria* adopted in Hooker and Bentham's "Genera Plantarum," and in Engler and Prantl's "Pflanzenfamilien"; but Kranzlin, in his monograph prepared for the "Pflanzenreich," has revived the genus *Jovellana*, which includes both the New Zealand species. It only differs in the two lips of the corolla being nearly equal, whereas in *Calceolaria* proper the upper lip is much smaller than the other.

The distribution of *Calceolaria* is of great interest to the botanical geographer, inasmuch as the genus is found only in South America and New Zealand. But, as is well known, this fact is precisely paralleled by that of *Fuchsia*. These two genera form by far the most striking proof of a special relationship between the flora of South America and New Zealand.

PLATE 147. *Calceolaria Sinclairii*, drawn from specimens collected by Mr. W. Townson on the coast-line a little to the north of Gisborne. Fig. 1, flower, with the corolla removed ($\times 5$); 2, calyx and style ($\times 5$); 3, corolla ($\times 2\frac{1}{2}$); 4, base of corolla, with stamens ($\times 8$); 5, transverse section of ovary ($\times 6$); 6, ripe capsule ($\times 6$); 7, seeds ($\times 10$).



M. Smith del.
J.N. Pritch lith.

West, Newman imp.

VERONICA DIVERGENS, *Cheesem.*

PLATE 148.—VERONICA DIVERGENS.

FAMILY SCROPHULARIACEÆ.]

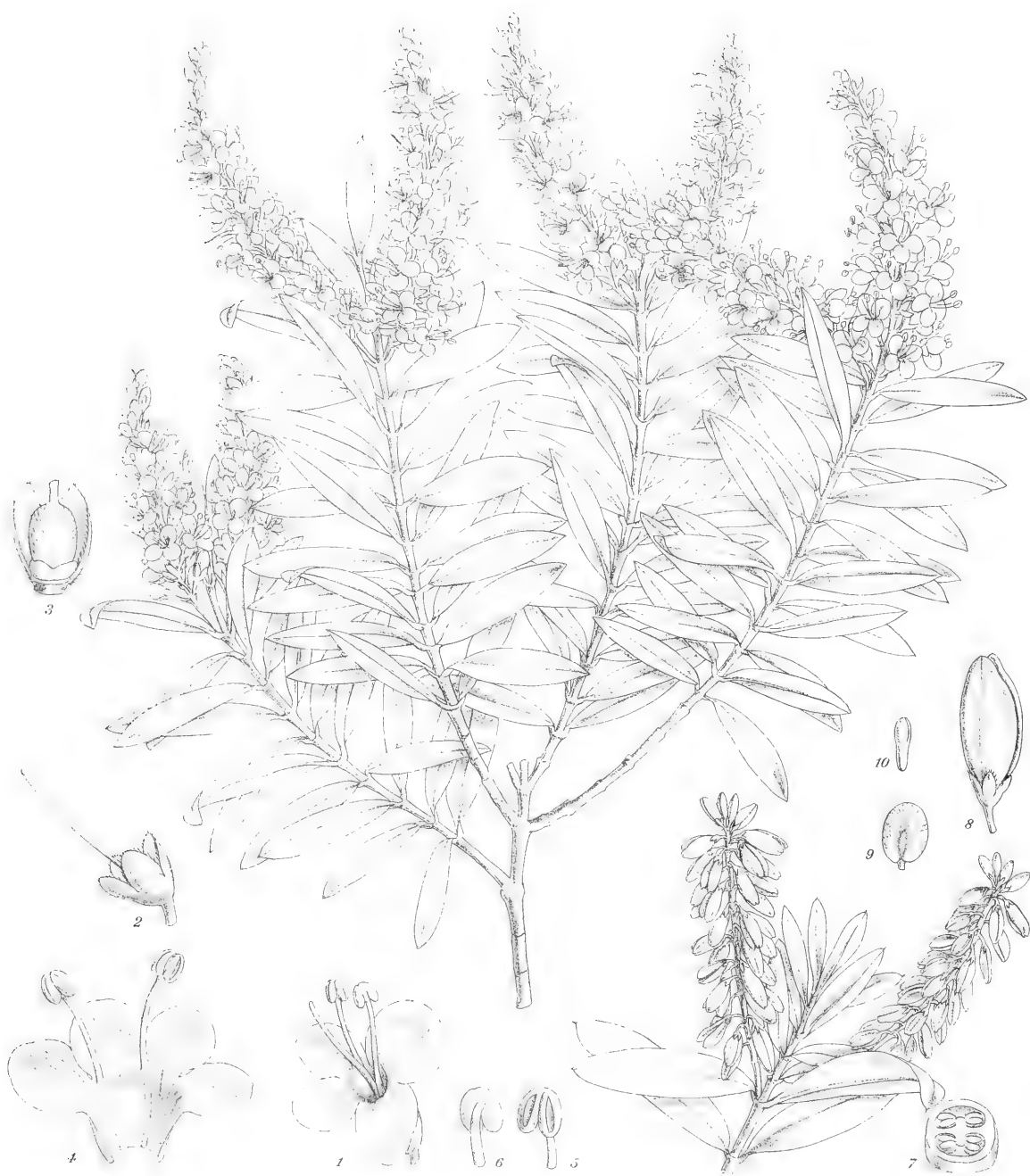
[GENUS VERONICA, LINN.

Veronica divergens, *Cheesem. Man. N.Z. Fl.* 502.

Veronica divergens, as a species, is based upon specimens collected by Mr. W. Townson on rocks near the sea at Brighton, the mouth of Fox's River, situated about twenty-five miles south of Westport. So far as I am aware, it has not been found in any other locality; but then very little is known of the vegetation of the coast-line between Westport and Greymouth, or of Westland generally, and in all probability the plant will be found in similar situations elsewhere in those districts. With reference to the Brighton locality, Mr. Townson informs me that he only met with it for a mile or two to the south of Fox's River, where, however, it was fairly abundant, forming bushes attaining an extreme height of 8 ft. or 10 ft. The flowers were borne in great profusion, so that it was a very striking object. It appeared to be purely littoral, and was not noticed far from the actual coast-line.

The distinguishing characters of *V. divergens* appear to be the small oblong or elliptic-oblong flat spreading leaves, long dense racemes, very short and broad corolla-tube, oblong-ovate obtuse or subacute sepals, and broadly oblong subacute capsules. It has some relationship with *V. macroua* var. *dubia*, but that is a smaller much more diffuse plant, with rather larger and proportionately broader leaves, which are edged with a white pubescent line. The flowers much resemble those of *V. gracillima*, but the leaves are altogether unlike, being shorter, broader, and not so acute. Its cross-relationships make it difficult to place; but, on the whole, I think that it is best kept in the vicinity of *V. macroua*.

PLATE 148. *Veronica divergens*, drawn from specimens collected by Mr. W. Townson at Brighton, about twenty-five miles south of Westport. Fig. 1, flower ($\times 4$); 2, a side view of the same, showing the calyx and a detached bract ($\times 4$); 3, section of calyx, showing ovary and style ($\times 5$); 4 and 5, front and back view of anthers ($\times 8$); 6, ripe capsule ($\times 5$); 7, seed (enlarged).



M. Smith del
J. N. Pritch lith

West, Newman imp

VERONICA LEIOPHYLLA, *Cheesem.*

PLATE 149.—VERONICA LEIOPHYLLA.

FAMILY SCROPHULARIACEÆ.]

[GENUS VERONICA, LINN.

Veronica leiophylla, Cheesem. Man. N.Z. Fl. 509.

V. parviflora var. *phillyreæfolia*, Hook. f. Fl. Nov. Zel. i, 192.

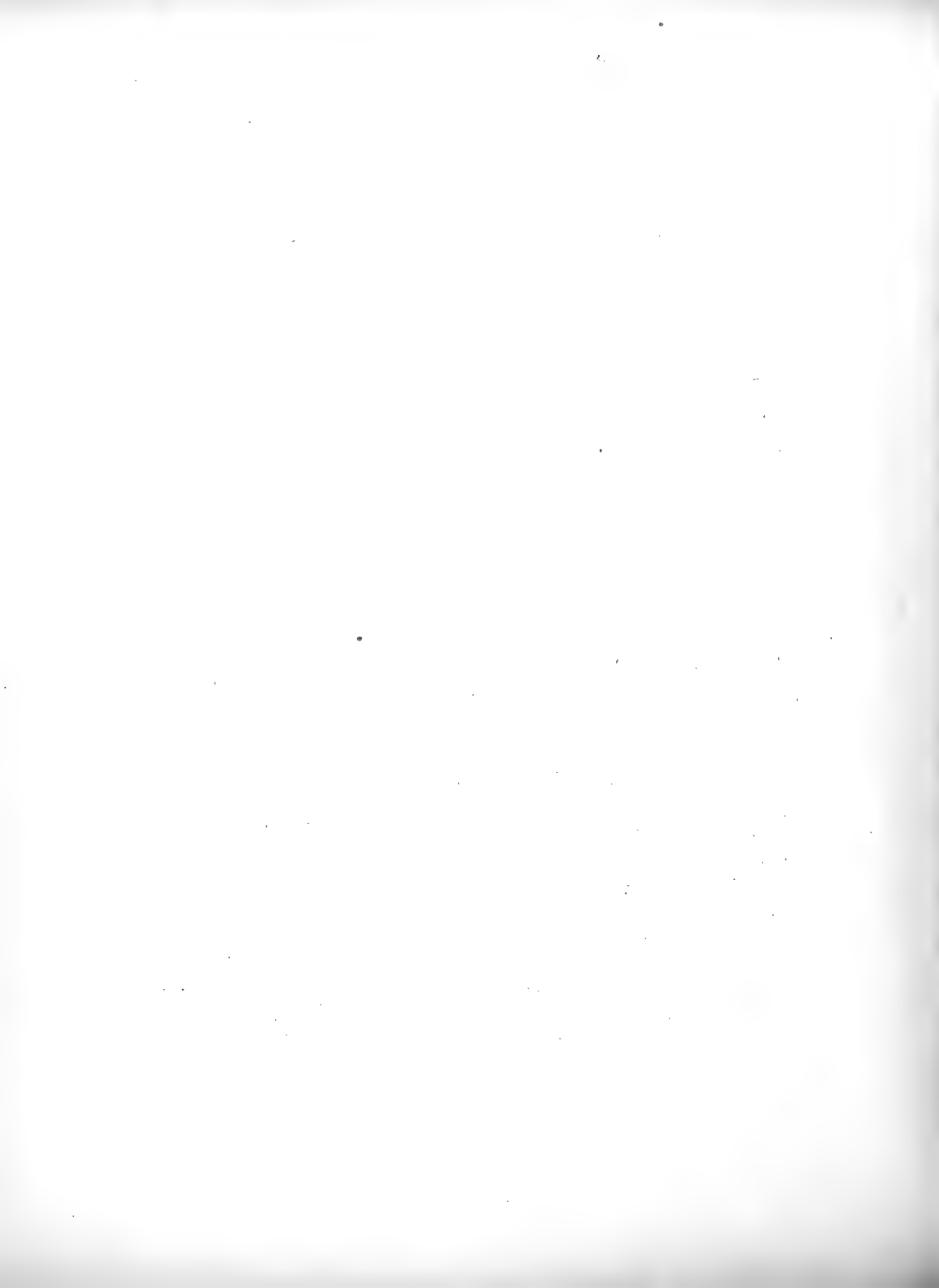
This fine plant, and, to my mind, perfectly distinct species, was originally discovered by Mr. J. C. Bidwill in some locality in the Nelson Provincial District. In the "Flora Novæ Zelandiæ" Sir J. D. Hooker placed it as "*Veronica parviflora* var. β *phillyreæfolia*," distinguishing it from the typical form of *V. parviflora* by the following characters: "Foliis anguste lineari-elliptico-oblongis subacutis, racemis folio longioribus densifloris, sepalis parvis obtusis, corollis majusculis"—a diagnosis which must be regarded as remarkably apt and expressive. No mention whatever is made of it in the "Handbook," and there is nothing to show whether it is included in *V. parviflora* or placed with some other species.

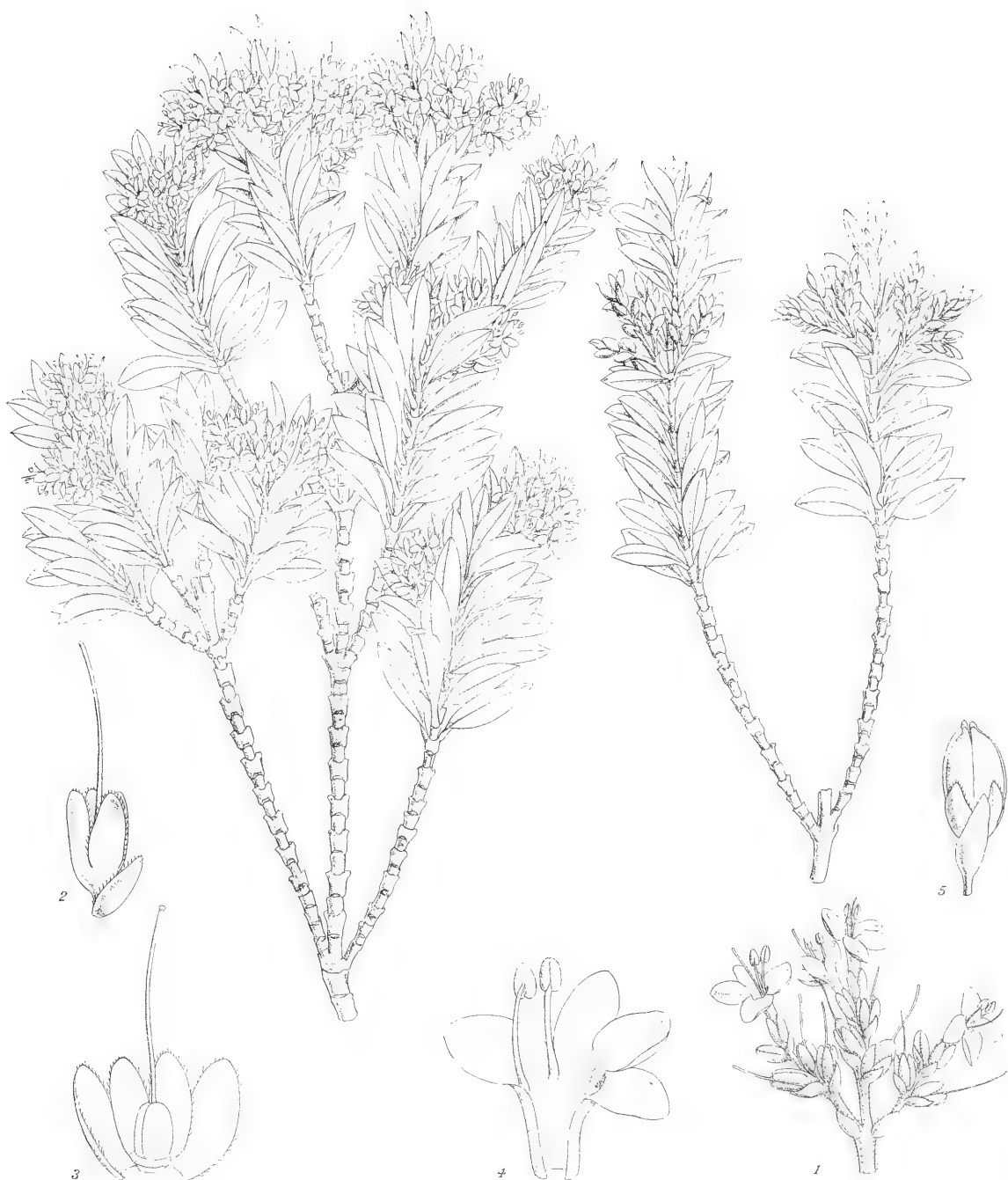
After the publication of the "Handbook" it became known to most New Zealand botanists, and was variously referred to *V. parviflora*, *V. ligustrifolia*, and *V. Traversii*. Believing that it cannot be correctly placed under any of these, an opinion in which I have the support of Mr. N. E. Brown, of Kew, I ultimately described it in the Manual under the name of *V. leiophylla*. As to its distribution, it appears to be far more plentiful in Nelson, Marlborough, and North Canterbury than anywhere else, although it occurs in eastern Canterbury and Otago as far south as Lake Te Anau. It is most abundant in river-valleys, and is especially plentiful in the Wairau and Awatere Valleys, the upper part of the Buller Valley, &c. Its altitudinal range is from sea-level to 3,000 ft.

As a species I regard *V. leiophylla* as absolutely marked off from *V. parviflora* by the flat linear-oblong subacute or obtuse leaves, and much larger flowers and capsules. In addition, *V. parviflora* has smaller and narrower acute leaves, keeled beneath, and the racemes are not much longer than the leaves, whereas they conspicuously exceed the leaves in *V. leiophylla*. *V. Traversii*, if I am correct in my identification of that very problematical plant, certainly is a near ally, but is distinct in its shorter and broader usually acute leaves, smaller flowers with a shorter tube to the corolla, and smaller capsules.

From a horticultural point of view *V. leiophylla* has much to recommend it. It is easy of cultivation, does not require special shelter, and will succeed in any ordinary soil. Its habit is neat and compact, and it usually blooms with great regularity and profusion.

PLATE 149. *Veronica leiophylla*, drawn from specimens collected in the central portions of the Nelson Provincial District. Fig. 1, flower ($\times 4$); 2, calyx ($\times 4$); 3, section of calyx, showing ovary *in situ* ($\times 5$); 4, corolla laid open ($\times 4$); 5 and 6, front and back view of anthers ($\times 6$); 7, transverse section of ovary ($\times 6$); 8, capsule ($\times 4$); 9, seed (enlarged); 10, embryo (enlarged).





W. Smith del
J. H. Fitch lith

VERONICA RIGIDULA, *Cheesem.*

West, Newman imp.

PLATE 150.—VERONICA RIGIDULA.

FAMILY SCROPHULARIACEÆ.]

[GENUS VERONICA, LINN.]

Veronica rigidula, *Cheesem. Man. N.Z. Fl.* 514.

I am indebted to Mr. J. H. Macmahon, so well known from his successful botanical explorations in the Marlborough Provincial District, for drawing my attention to this curious little plant. His first specimens were obtained from rocks by the side of streams in the Pelorus and Rai Valleys, but he subsequently collected it on Mount Duppa, and at Maungatapu. All these localities are on the eastern side of the Dun Mountain Range, and in the watershed of the Pelorus River, and are practically within ten miles of one another. I do not know of any other stations for the plant, unless some flowerless specimens collected by myself in the Wairau Gorge many years ago prove to be referable to it.

V. rigidula is a small much-branched shrub, often flowering when not much more than 6 in. high; and, according to Mr. Macmahon, seldom if ever exceeding 24 in. The branches are stout, black, peculiarly scarred, and are leafy at the tips only. The leaves are close-set, suberect, elliptic-oblong or obovate-oblong, keeled, dark green above, glaucous beneath, about $\frac{1}{2}$ in. to $\frac{3}{4}$ in. long. The racemes are lateral near the tips of the branches, and are trifurcate, very rarely simple; the pedicels are wanting, or the lower flowers alone are stalked. The calyx-segments are small and obtuse, while the corolla-tube is nearly double the length of the calyx. The capsule is ovoid-oblong, subacute, barely twice the length of the calyx.

On the whole, I regard *V. rigidula* as a distinct little species. It has a superficial resemblance to *V. Colensoi* (as that species is limited in my Manual), but can be at once distinguished by the smaller and more close-set petiolate keeled leaves, shorter and stouter racemes, smaller flowers, and particularly by the obtuse calyx-segments and longer corolla-tube with a shorter limb. In *V. Colensoi* the calyx-segments are acute, and the corolla-tube is shorter than the calyx. *V. rupicola* differs altogether in habit, in the larger long-petioled linear-obovate flat leaves, in the much longer racemes, large bracts, shorter corolla-tube, and larger capsule.

PLATE 150. *Veronica rigidula*, drawn from specimens collected by Mr. J. H. Macmahon by the Pelorus River, Marlborough. Fig. 1, portion of inflorescence ($\times 3$); 2, calyx and style, with a bract at the base of the calyx ($\times 6$); 3, calyx laid open ($\times 6$); 4, corolla laid open ($\times 6$); 5, ripe capsule ($\times 4$).



M. Smith del.
J. N. Fitch lith.

West, Newman Imp.

VERONICA MATTHEWSII, *Cheesem.*

PLATE 151.—VERONICA MATTHEWSII.

FAMILY SCROPHULARIACEÆ.]

[GENUS VERONICA, LINN.]

Veronica Matthewsii, *Cheesem. Man. N.Z. Fl.* 517.

This handsome plant worthily commemorates the name of the late Mr. H. J. Matthews, for many years the head of the Forestry Department, and to whose active and zealous aid all New Zealand botanists are much indebted. During the early part of the preparation of this work he was indefatigable in forwarding material and notes, which in several cases were of very great service. His premature death leaves a serious gap in the limited number of workers who are interested in New Zealand botany from both its scientific and practical aspects; and on that account and for other reasons is much to be regretted.

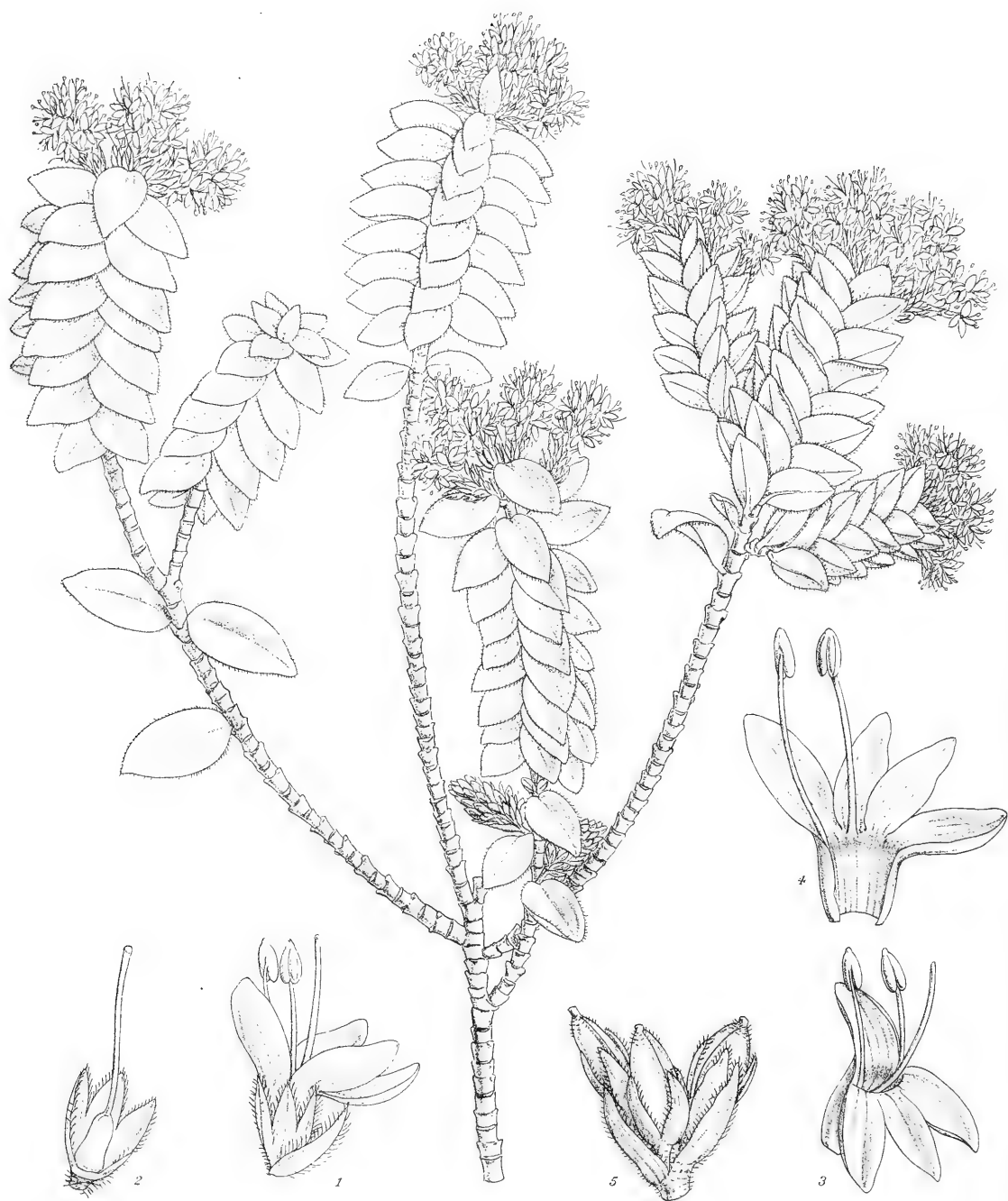
The specimens figured in this plate are from plants cultivated in Mr. Matthews's garden at Mornington, near Dunedin. These were originally obtained from the Humboldt Mountains, to the west of Lake Wakatipu, an unusually rich locality for alpine plants, and one still very imperfectly explored. I have also seen a few wild specimens from the same locality, together with others collected by Sir Julius von Haast and Mr. Armstrong in the Canterbury Alps, and by Mr. J. D. Enys in Milford Sound. It is not uncommon in cultivation in the South Island, and until quite lately has been treated as a variety of *V. Traversii*.

V. Matthewsii has a very distinctive habit and appearance. It has stout terete branches often purplish-red when young, which bear numerous close-set thick and coriaceous flat leaves $\frac{3}{4}$ in. to $1\frac{1}{2}$ in. long. These are oblong or elliptic-oblong, obtuse, sessile and rounded at the base. The racemes are near the tips of the branches or rarely lateral, large, 2 in. to 4 in. long including the peduncle, densely many-flowered. The flowers are large, $\frac{1}{4}$ in. to $\frac{1}{3}$ in. diameter, white or purplish. The calyx-segments are obtuse, barely reaching half-way up the rather slender corolla-tube. The capsule is about $\frac{1}{2}$ in. long, obtuse or subacute, about twice as long as the calyx.

As mentioned above, *V. Matthewsii* has hitherto been confused with *V. Traversii*. It is, however, a much more robust plant with a different habit of growth; the leaves are thicker and more coriaceous, and much more obtuse; and the racemes are larger and stouter, with much larger flowers. Judging from the description and the plate given in the *Botanical Magazine*, it is probably nearer to *V. Balfouriana*, a species apparently only known in cultivation in England. But it differs from that in the larger leaves, obtuse calyx-segments, and much longer corolla-tube, which in *V. Balfouriana* is barely longer than the calyx.

V. Matthewsii does well in cultivation, like many other of the indigenous species, and is deserving of greater attention than has yet been paid to it.

PLATE 151. *Veronica Matthewsii*, drawn from specimens cultivated in the garden of the late Mr. H. J. Matthews, Mornington, Dunedin. Fig. 1, flower with bract ($\times 5$); 2, back view of flower ($\times 5$); 3, calyx laid open, showing ovary and style ($\times 6$); 4, corolla laid open ($\times 4$); 5 and 6, front and back view of anther ($\times 6$); 7, ripe capsule ($\times 5$).



M. Smith del.
J. N. Fitch lith.

VERONICA GIBBSII, T. Kirk.

West, Newman imp.

PLATE 152.—VERONICA GIBBSII.

FAMILY SCROPHULARIACEÆ.]

[GENUS VERONICA, LINN.]

Veronica Gibbsii, T. Kirk in *Trans. N.Z. Inst.* xxviii (1896), 524; *Cheesem. Man. N.Z.* Fl. 524.

Veronica Gibbsii is named in honour of Mr. F. G. Gibbs, M.A., of Nelson, who for many years has been a diligent and painstaking investigator of the flora of the Nelson Provincial District, and who has made several important discoveries, as *Ligusticum diversifolium*, *Celmisia Gibbsii*, *Raoulia Gibbsii*, *Gentiana vernicosa*, &c. He has also collected much fresh information bearing upon the distribution of the species constituting the Nelson flora.

V. Gibbsii was originally discovered on Mount Rintoul and Ben Nevis, two of the chief peaks of the Dun Mountain Range, and situated from twenty to thirty miles from Nelson in a southerly direction. Probably it exists on other peaks on the same range, but I have no proof to that effect. It may here be remarked that the Dun Mountain Range has in some respects a distinct and curious vegetation, possibly associated with its peculiar geological structure. In addition to *Veronica Gibbsii*, at least three other plants are apparently confined to it—*Raoulia Gibbsii*, *Myosotis Monroi*, and *Pimelea Suteri*.

V. Gibbsii is a sparingly branched shrub from 9 in. to 18 in. high, usually found in rocky places. The leaves are close-set, spreading, ovate or ovate-oblong in shape, coriaceous, usually glaucous, but often tinged with purplish-red, glabrous except the margins, which are fringed with long soft white hairs. The flowers are white, and are arranged in spikes near the tips of the branches. The calyx-segments are ovate-lanceolate, acute, and the margins are villous. The capsule is narrow-ovoid, acute, compressed, about twice as long as the calyx.

V. Gibbsii is a distinct species, which cannot be confused with any other. Its nearest ally is probably *V. carnosula*, from which, however, it is easily distinguished by the less concave and more acute leaves, and especially by their conspicuously villous margins. Its bracts, too, are more acuminate, and the calyx-segments are narrower and more acute. The villous margins of the leaves constitute a very remarkable character, and one which cannot be matched among the rest of the eighty-five species of the genus found in New Zealand.

PLATE 152. *Veronica Gibbsii*, drawn from specimens collected by Mr. F. G. Gibbs on Ben Nevis, Nelson, at an altitude of 4,000 ft. Fig. 1, flower, showing bract at the base ($\times 5$); 2, section of calyx, showing ovary and style ($\times 5$); 3, corolla ($\times 5$); 4, the same laid open ($\times 5$); 5, group of ripe capsules ($\times 5$).



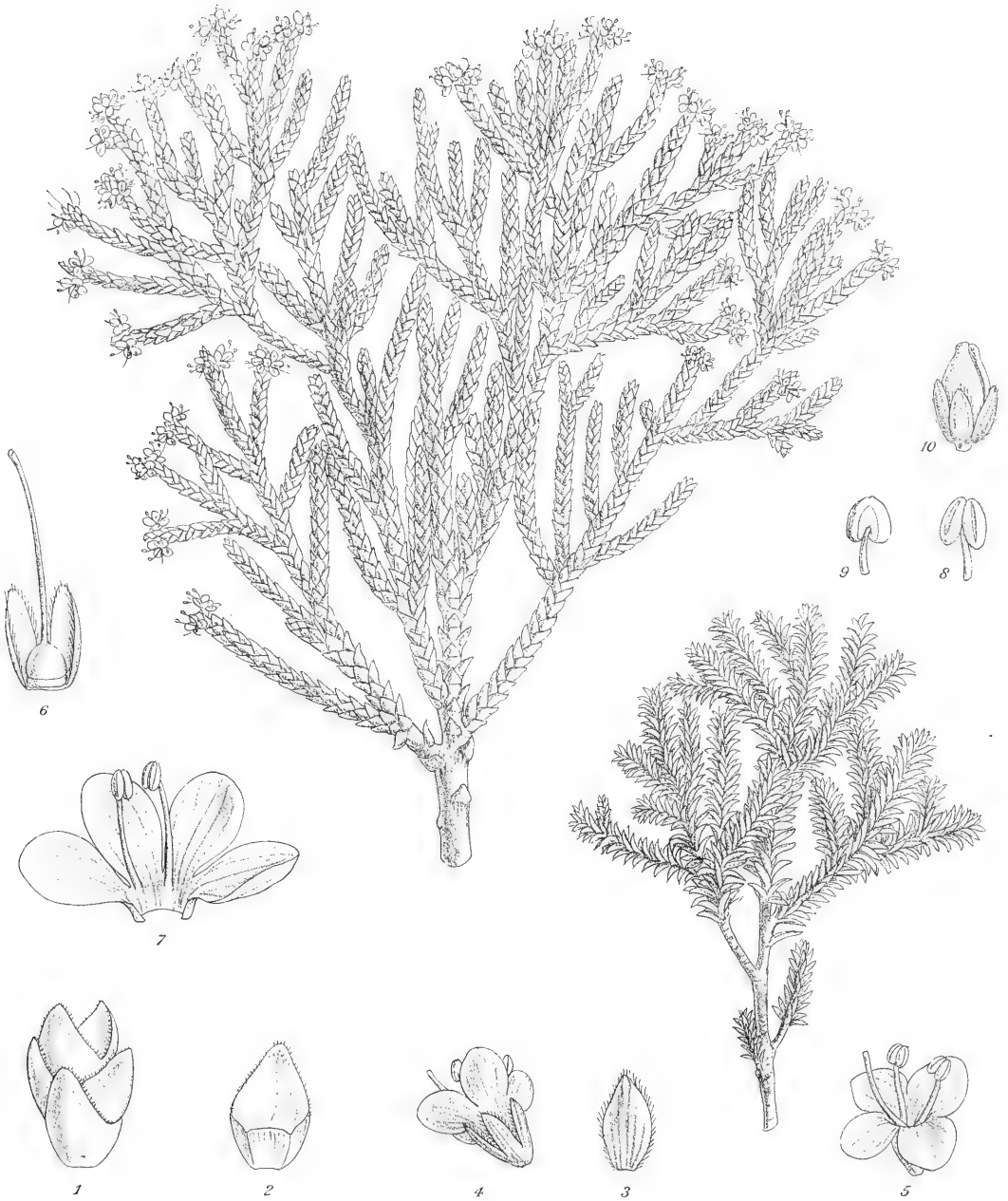


PLATE 153.—VERONICA TETRAGONA.

FAMILY SCROPHULARIACEÆ.]

[GENUS VERONICA, LINN.

Veronica tetragona, Hook. Ic. Plant. t. 580; *Cheesem. Man. N.Z. Fl.* 530.

A botanist obtaining his first knowledge of the genus *Veronica* in the Northern Hemisphere would find it composed almost entirely of herbaceous plants seldom more than a couple of feet in height, and usually much less, the great majority of the species having a decidedly weedy aspect; but on visiting New Zealand his conception of the genus would be entirely altered. He would see some species attaining the height of trees, one in particular reaching an altitude of 30 ft., with a trunk sometimes nearly 2 ft. in diameter; and he would find a considerable number forming large and compactly branched shrubs. And at the other end of the scale he would make the acquaintance of two or three species so reduced in size as to form small moss-like tufts on the mountains, sometimes barely an inch in diameter. But in particular would he be surprised to notice a remarkable section of the genus, absolutely unknown in the Northern Hemisphere, in which the leaves are so greatly reduced in size as to become scale-like, and, being closely imbricated and appressed to the branch, give it a curious appearance resembling a strand of plaited cord. From this peculiarity the section has received the name of the "Whipcord *Veronicas*." This section contains no less than twelve species, of which *V. tetragona*, the subject of this plate, is one of the most remarkable.

Veronica tetragona was first discovered by Mr. J. C. Bidwill during the well-known ascent of Ngauruhoe made by him in the year 1839. His specimens were apparently forwarded to Kew through Mr. Colenso, for in the original description given in the "Icones Plantarum" (t. 580) it states that it was collected "near the perpetual snow on the summit of Tongariro, a high and volcanic mountain in the middle of the Island, gathered, with many other novelties existing there, by a gentleman who visited the Church of England Missionary Station about three days' journey from the mountains, and who gave them to Mr. Colenso." In the "Flora Novæ Zelandiæ" the locality is simply given as "Tongariro; Bidwill." Flowerless specimens sent by Dieffenbach as having been gathered in Queen Charlotte Sound were, however, the first to reach England, although Dieffenbach could not have collected them at an earlier date than Bidwill. In the absence of flowers and fruit their identity with *Veronica* was not suspected; and the scale-like leaves presented such a close resemblance to those of some *Podocarpus* that Sir W. J. Hooker had a plate prepared for the "Icones" under the name of *Podocarpus Dieffenbachii*. Bidwill's specimens arrived just in time to prevent the publication of the name, but not of the plate (t. 547). In reference to it Sir W. J. Hooker remarks, "At the time the accompanying figure was drawn and engraved we are not ashamed to acknowledge that it was taken by us for a *Podocarpus*. Little did we think it was a *Veronica*, as it has since proved to be, by a comparison with an indifferent flowering specimen, indeed, but undoubtedly the same species given at tab. 580 of the present volume."

Since the times of Bidwill and other early visitors it has been ascertained that *V. tetragona* is an abundant plant on the central volcanic plateau of the North Island. It can be observed all round the base of Tongariro, Ngauruhoe, and Ruapehu, becoming plentiful at about 3,000 ft. elevation, and ascending to fully 5,000 ft. It has also been gathered on the adjoining Kaimanawa Mountains, and on the isolated Mount Hikurangi, in the East Cape district. In the Tararua Range

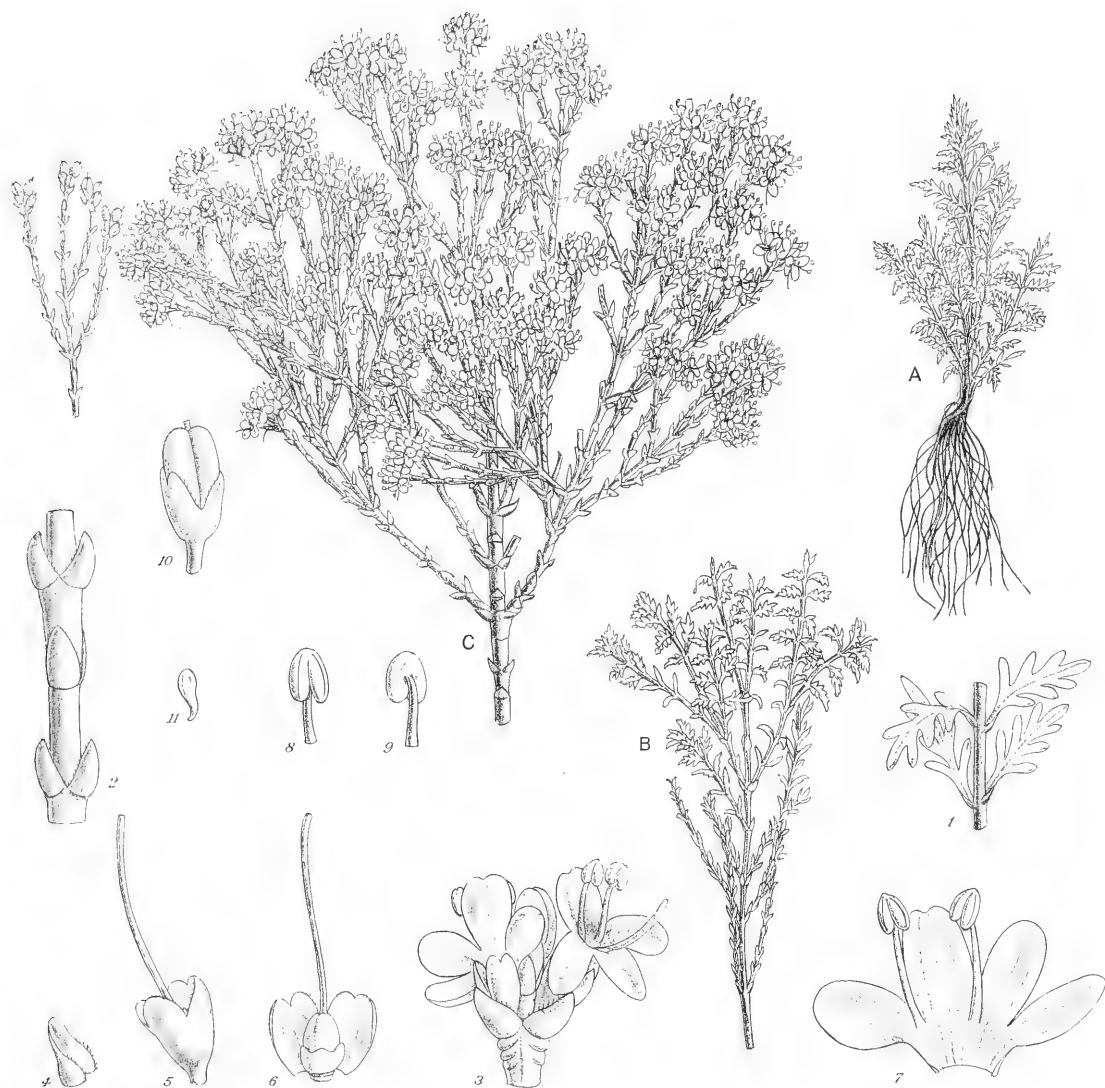
it appears to be replaced by the very closely allied *V. Astoni*, a plant which many botanists will prefer to consider a variety only. In the "Handbook" several localities were recorded from the South Island, but no specimens have been obtained therefrom in late years.

V. tetragona is a small branching shrub, usually forming a round-topped bush 1 ft. to 3 ft. in height. The branches are stout and erect, and are densely clothed with short and thick closely appressed scale-like leaves, which being opposite and decussate give the branch a tetragonous appearance. The flowers are white or nearly so, and are sessile amongst the uppermost leaves, forming small terminal heads. In young plants the leaves are much longer and narrower, linear-subulate with a broad base, and are not nearly so closely appressed. I have not seen the leaves of seedlings, and cannot say whether they show any approach to those of *V. lycopodioides*, in which they are frequently lobed or pinnatifid.

It may here be remarked that all the species of the section to which *V. tetragona* belongs, so far as they have been investigated, have in their juvenile state leaves differing very greatly from those of the adult, and always much exceeding them in size. They are not appressed, but spread outwards, and they usually possess a more or less well-defined petiole and lamina. They thus approach the ordinary leaf-form of the genus, from which the leaves of the mature plant have so greatly departed. These juvenile leaves may under favourable circumstance appear on adult plants, or they may be caused to appear by cultivating the plant in a moist chamber. As they must be regarded as more primitive than the mature leaves, they probably give us some insight into the phylogeny of the whipcord *Veronicas*, and show that in all probability they have been derived from ancestors which possessed foliage much better developed than their present representatives. For further particulars the student should refer to papers by Kirk and Cockayne in the "Transactions of the New Zealand Institute," and to several of Dr. Goebel's works.

In several of the whipcord *Veronicas* the juvenile form of the foliage persists for several years. Thus near the base of Ruapehu, and on the saddle between it and Ngauruhoe, I noticed quite a considerable number of fairly large plants of *V. tetragona* still retaining their juvenile foliage, and showing no trace of the mature stage. These plants were mixed with others covered with the short appressed and scale-like leaves of the adult, some of these latter being much smaller than those retaining the juvenile leaves. A branch from one of the plants still clothed with juvenile leaves is figured in the lower corner of this plate.

PLATE 153. *Veronica tetragona*, drawn from specimens collected at the base of Mount Ruapehu, at an altitude of 3,000 ft. Fig. 1, portion of branchlet, showing arrangement of the leaves ($\times 4$); 2, inner face of leaf ($\times 4$); 3, bract ($\times 4$); 4 and 5, different views of a flower ($\times 4$); 6, section of calyx, showing ovary and style ($\times 4$); 7, corolla laid open ($\times 6$); 8 and 9, front and back view of anther; 10, capsule ($\times 3$).



M. Smith del.
J.N. Fitch hth

West, Newman imp.

VERONICA CUPRESSOIDES, Hook f.

PLATE 154.—VERONICA CUPRESSOIDES.

FAMILY SCROPHULARIACEÆ.]

[GENUS VERONICA, LINN.

Veronica cupressoides, Hook. f. *Handb. N.Z. Fl.* 212; *Cheesem. Man. N.Z. Fl.* 533.

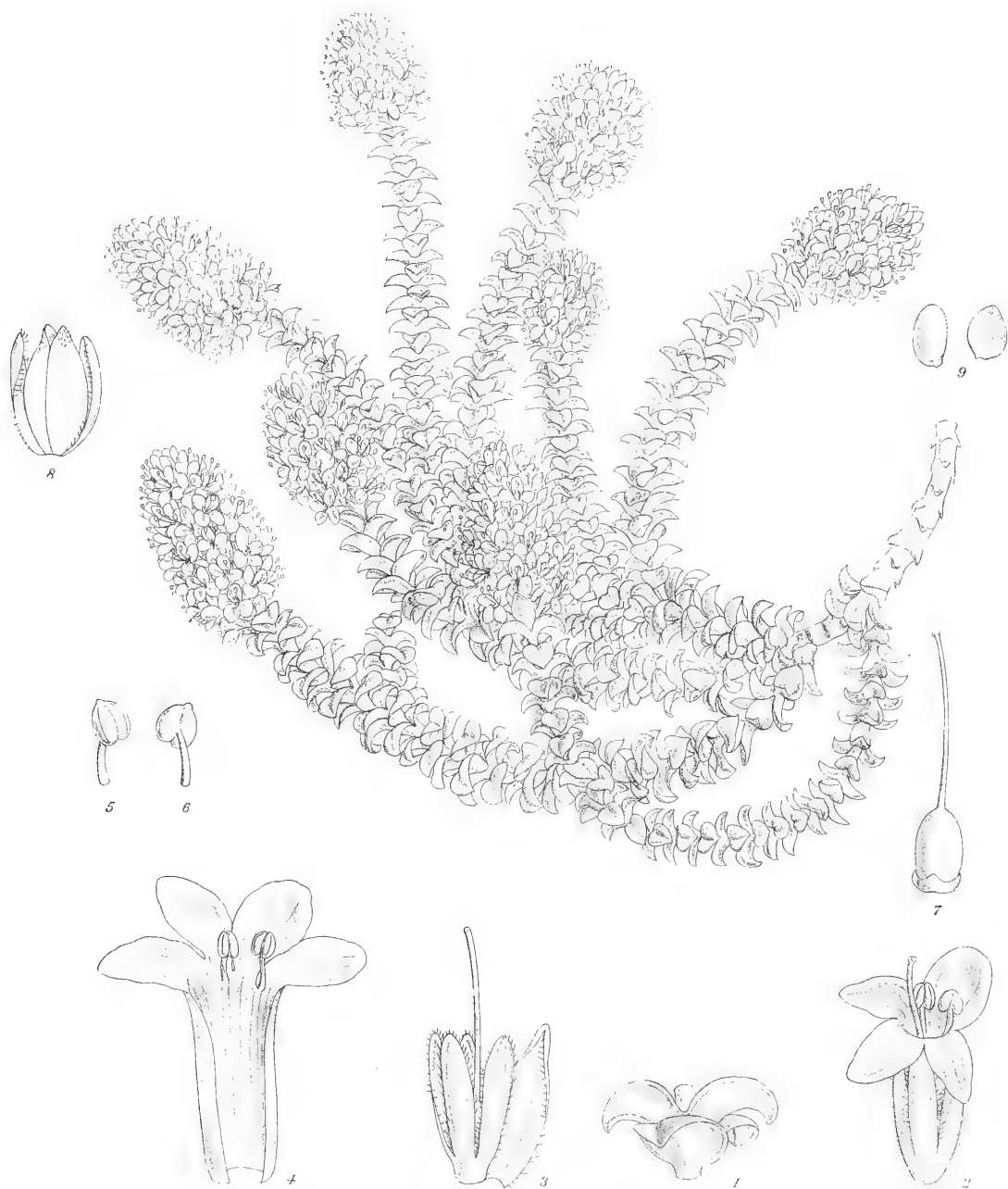
Veronica cupressoides is another member of the group of whipcord *Veronicas* alluded to under the previous plate, and probably the most remarkable. It was first discovered by Dr. Sinclair in 1859 or 1860 at the Wairau Gorge, Nelson; and at Tairāhema, between the Wairau Valley and the Clarence. Many years afterwards I gathered the species in probably the actual localities in which it was found by Sinclair. It was next collected by Mr. W. T. L. Travers in the Wairau Valley, and by Sir Julius von Haast in the Ashburton district, Canterbury; while in 1863 it was found by Sir James Hector and Mr. Buchanan in the Lake district of Otago. Its range, so far as is known at the present time, is from the Wairau Gorge southwards to Lake Te Anau. Apparently it is unknown on the western side of the Southern Alps, although in some localities, such as Lake Tennyson, Harper's Pass, &c., it comes very near to the actual watershed. Thirty or forty years ago it was much more plentiful than now, for, being generally an inhabitant of river valleys or terraces, it has suffered greatly from the almost universal practice of burning off the vegetation in such localities. Its altitudinal range I take to be from 2,000 ft. to 4,500 ft.

V. cupressoides, in the localities in which I myself have seen it, forms a closely branched round-topped shrub 2 ft. to 6 ft. or even 8 ft. high. The branches spread considerably; the branchlets are very numerous, slender, green, clothed with small decussate scale-like leaves resembling those of a cypress. Unlike all the other whipcord *Veronicas*, the leaves are in remote pairs, separated from one another by quite a considerable interval. The flowers are pale bluish-purple or nearly white, and are sessile close to the tips of the branchlets, forming small heads. The capsule is small, narrow-obovoid.

The whipcord *Veronicas* are remarkable for the extent to which they resemble plants of very different families. *V. cupressoides* possibly offers as striking an instance as any, for the manner in which the branchlets mimic, as it were, those of a cypress never fails to impress the most casual observer. We have already seen that *V. tetragona*, when first discovered, was actually figured in mistake for a *Podocarpus*. *V. lycopodioides* has much of the aspect of several *Lycopods* with appressed scale-like leaves. Finally, *V. salicornioides* was named on account of the likeness of its branchlets to those of a species of *Salicornia*.

V. cupressoides does well in cultivation, especially in the middle and southern portion of the Dominion, where it succeeds in almost any open loamy soil if provided with a little shade. In a cool and damp situation it frequently produces reversion shoots with juvenile leaves.

PLATE 154. *Veronica cupressoides*, drawn from specimens collected by the Broken River, Canterbury Alps, at an altitude of 3,000 ft. A, seedling; B, reversion shoot with juvenile leaves, taken from the base of an old plant; C, branch from a mature plant. Fig. 1, branchlet, with leaves from A ($\times 3$); 2, branchlet, with leaves from mature plant ($\times 6$); 3, tip of branch, with two flowers ($\times 6$); 4, bract ($\times 6$); 5, calyx ($\times 6$); 6, the same laid open, showing the ovary and style ($\times 6$); 7, corolla laid open ($\times 8$); 8 and 9, front and back view of anther ($\times 10$); 10, ripe capsule ($\times 5$); 11, embryo (enlarged).



M. Smith del.
J.N. Fitch lith.

West, Newman amp.

VERONICA EPACRIDEA, Hook. f.

PLATE 155.—VERONICA EPACRIDEA.

FAMILY SCROPHULARIACEÆ.]

[GENUS VERONICA, LINN.]

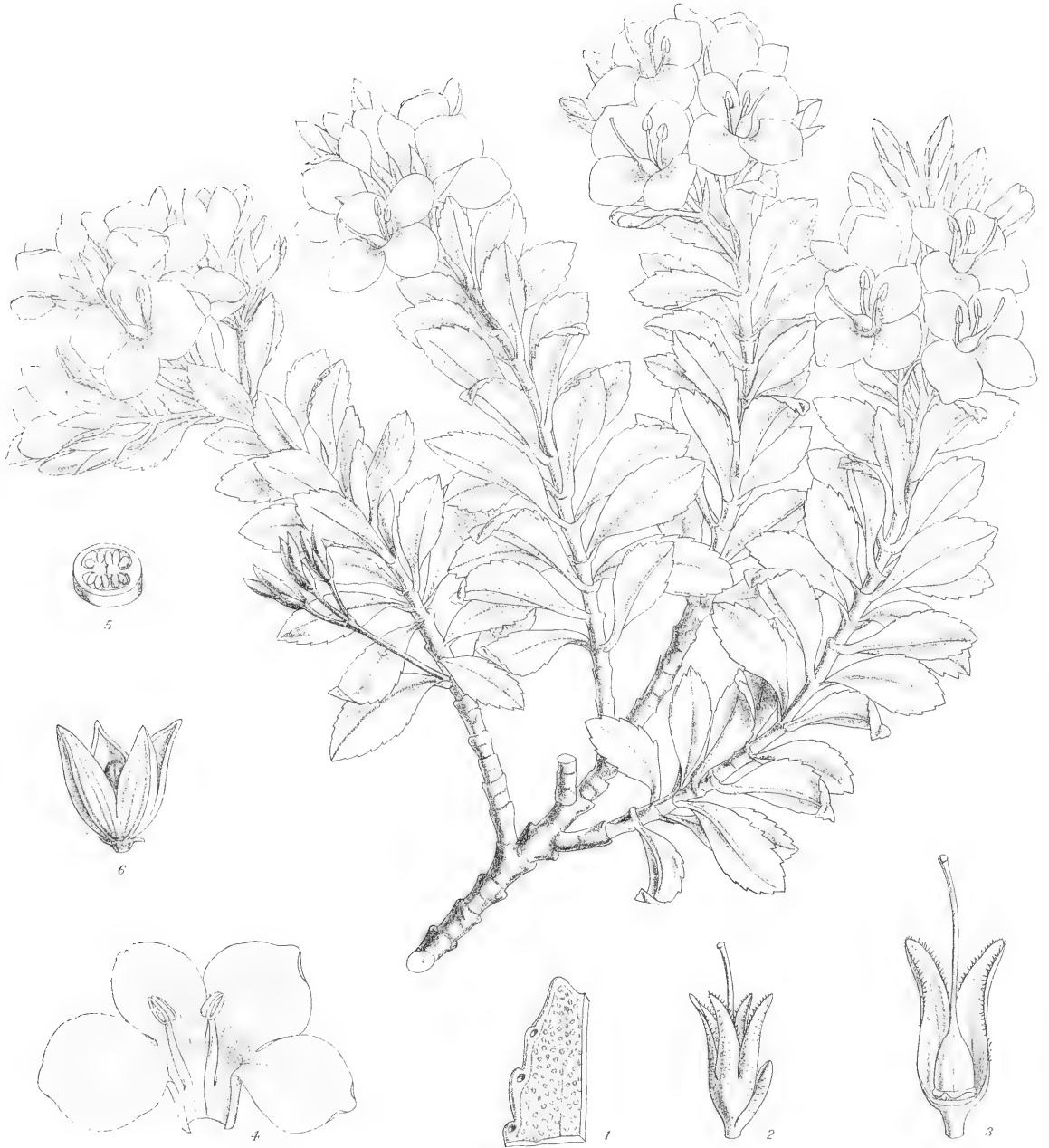
Veronica epacridea, Hook. f. *Handb. N.Z. Fl.* 213; *Cheesem. Man. N.Z. Fl.* 535.

The subject of the present plate has a very different aspect from the two species previously figured. Its habit is altogether unlike, for it forms a much-branched prostrate or decumbent shrub seldom more than a few inches in height. Its branchlets, instead of being very numerous, slender, erect, and clothed with minute scale-like leaves, as is the case in *V. tetragona* and *V. cupressoides*, are comparatively few in number, decumbent at the base, and then curved upwards, and densely clothed with spreading and recurved rigid and coriaceous leaves. These in their size, shape, and mode of arrangement recall those of some Australian species of *Epacris*; which no doubt is the reason for Hooker's specific name; and the flowers, instead of being placed in little heads obviously lateral to the branch although near its tip, are compacted into a single large ovoid cluster terminating the branch.

Like the previous species, *V. epacridea* was originally discovered by Dr. Sinclair, his first specimens being obtained at Tarndale, a few miles from the Wairau Gorge, Nelson. It was next collected in the Waiau Valley by Mr. W. T. L. Travers, and in numerous localities in the Canterbury Alps by Sir Julius von Haast. Its range, so far as is known at the present time, stretches from Mount Arthur and Mount Peel, in north-west Nelson, where I gathered it as far back as 1881, southwards along the higher peaks of the Dun Mountain Range and the Wairau Mountains to the Spenser Mountains and Lake Tennyson, and from thence along the Southern Alps to the south of Lake Wanaka. It is a high alpine plant, seldom descending much below 4,000 ft., and frequently ascending to 6,500 ft. or even higher.

V. epacridea is often found on shingle-slopes, on which it probably attains its greatest size and luxuriance; but it is also found on rock-faces, or even on bare rocky ground. As a species it nearest relative is undoubtedly *V. Haastii*, some forms of which approach it very closely. But as a rule it is easily separated from that plant by the smaller size, sharply recurved leaves, which are much more coriaceous, and by the ciliate bracts and calyx-segments. *V. Haastii* is also a much greener and more fleshy and succulent plant. It can hardly be said that any other species even remotely approaches it.

PLATE 155. *Veronica epacridea*, drawn from specimens collected on Mount Peel, Nelson, at an altitude of 5,500 ft. Fig. 1, leaves ($\times 2$); 2, flower ($\times 4$); 3, calyx and bract ($\times 4$); 4, corolla laid open ($\times 5$); 5 and 6, front and back view of anthers ($\times 8$); 7, ovary and style ($\times 5$); 8, capsule ($\times 5$); 9, seeds (enlarged).



M. Smith del
J. N. Fitch lith.

West, Newman imp

VERONICA MACRANTHA, Hook. f.

PLATE 156.—VERONICA MACRANTHA.

FAMILY SCROPHULARIACEÆ.]

[GENUS VERONICA, LINN.

Veronica macrantha, Hook. f. *Handb. N.Z. Fl.* 213; *Cheesem. Man. N.Z. Fl.* 537.

Veronica macrantha is not a large-growing species, and its habit of growth is by no means as attractive as that of many others; but nevertheless, when seen in full flower, there are few species of the genus that present a more charming appearance. In the Mount Cook district, where it is most abundant, the sight of a rocky slope covered with multitudes of its pure-white flowers is a spectacle not easily paralleled and not likely to be readily forgotten.

Mr. W. T. L. Travers and Sir Julius von Haast were the first to observe *V. macrantha*. Where Mr. Travers gathered it I do not know, but Haast's locality is given as grassy hillsides in the Southern Alps, sources of the Waitaki, &c. Since its first discovery it has been proved to have a fairly extensive range in alpine districts in the South Island, but it is often local, and seldom extends far from the central chain of the Southern Alps. The most northern locality known to me is Mount Arthur and Mount Peel, where I have found it not uncommon. I have also gathered it on the Wairau Mountains, the Upper Clarence River, Lake Tennyson, and Arthur's Pass. From thence it seems to stretch southwards along the central chain to the Mount Cook district, the mountains at the head of Lake Hawea and Lake Wanaka, and as far south as the head of Lake Te Anau and the Clinton Valley. Its altitudinal range appears to be from 2,500 ft. to 5,500 ft.

V. macrantha is seldom more than 2 ft. in height, and is often much less; the branches are few in number, erect or spreading, and are bare of leaves except towards the top. The leaves are usually obovate, from $\frac{1}{2}$ in. to 1 in. in length, and are obtusely serrate. The racemes are axillary, 3-8-flowered; and the flowers, which are larger than in any other New Zealand species, are $\frac{3}{4}$ in. in diameter, and pure white. Usually the plant is found on steep and more or less rocky slopes, mixed with subalpine scrub of no great height—species of *Olearia*, *Senecio*, *Coprosma*, *Aciphylla*, *Ligusticum*, &c. In some of the valleys in the Mount Cook district it forms a considerable proportion of the vegetation.

As a species *V. macrantha* is allied to the magnificent *V. Benthami* of the Auckland and Campbell Islands, the only species found in the New Zealand area which has conspicuous blue flowers. But *V. Benthami* is more copiously branched, the leaves are larger, narrower, and are margined with white down, the racemes are longer and bear more numerous flowers, and the flowers are usually 5-merous, whereas they are always 4-merous in *V. macrantha*. The difference in the colour of the flowers in the two species is also noteworthy.

PLATE 156. *Veronica macrantha*, drawn from specimens collected in the Hooker Valley, Mount Cook district, at an altitude of 4,000 ft. Fig. 1, part of leaf ($\times 5$); 2, calyx, with bract at its base ($\times 2$); 3, section of calyx, showing ovary and style ($\times 3$); 4, corolla laid open ($\times 2$); 5, transverse section of ovary ($\times 5$); 6, ripe capsule, with the calyx removed ($\times 3$).



M. Smith del.
J.N. Pritch hth.

West, Newman imp.

VERONICA BIDWILLII, Hook. f.

PLATE 157.—VERONICA BIDWILLII.

FAMILY SCROPHULARIACEÆ.]

[GENUS VERONICA, LINN.

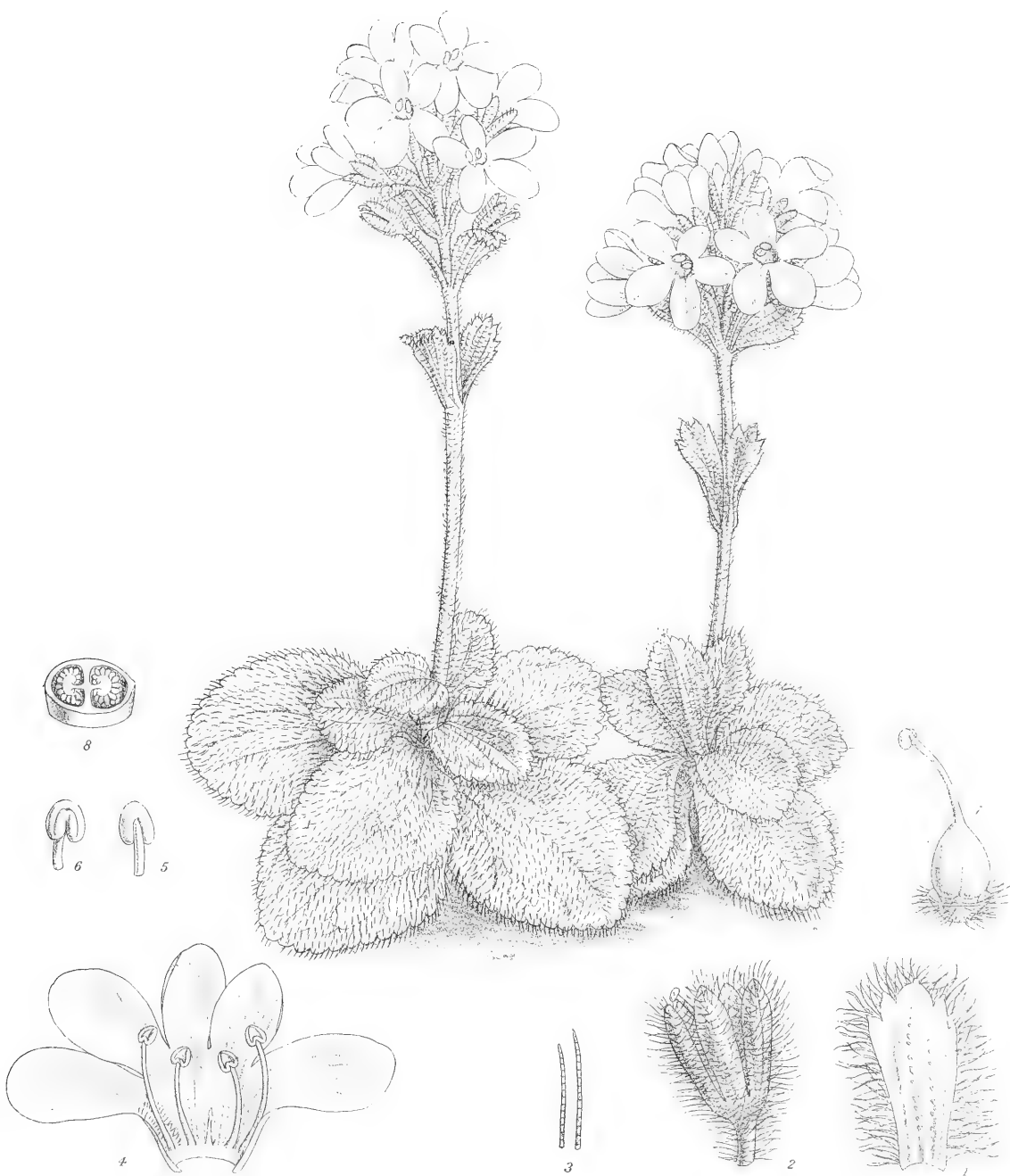
Veronica Bidwillii, Hook. *Ic. Plant.* t. 814; *Cheesem. Man.* N.Z. Fl. 513.

The nine species of *Veronica* previously figured in the "Illustrations" all belong to the section *Hebe*, which is confined to the Southern Hemisphere, and which practically includes all those species which have a shrubby or treelike habit. It is distinguished from the rest of the genus, with the exception of the group separated by Hooker under the name of *Pygmæa*, by the capsule being turgid, or compressed parallel to the septum, so that the longest diameter of the capsule is along the septum. All the species constituting the remainder of the genus are herbaceous, or very slightly woody at the base, and the capsule is compressed at right angles to the septum, so that the septum is across its narrowest diameter. This division includes the subject of this plate.

Veronica Bidwillii as its name implies, was originally discovered by Mr. J. C. Bidwill in the Wairau Valley, Nelson. Shortly afterwards it was gathered by Sir D. Monro, Mr. W. T. L. Travers, and other early explorers, and has since been seen in many parts of the South Island, from Collingwood southwards to Central Otago, ascending to quite 4,000 ft. I am not aware, however, of any locality on the western side of the dividing range. It is usually found on the broad stretches of stony ground which occupy most of the river-valleys of the Southern Alps, and which are often covered by water in floods. At such times they constitute part of the bed of the river to which their origin is due. In such localities *V. Bidwillii* is usually an abundant plant, forming carpets which cover considerable areas, the much-branched stems creeping close to the ground, and frequently entirely concealing it, while from the middle of the carpets rise numerous peduncles 6 in. to 9 in. high, strict and erect, and each bearing several rather large pale-pink flowers with darker lines.

V. Bidwillii is a remarkably distinct species, and can always be distinguished by its habit of forming dense carpets, by its minute uniform leaves, which vary from $\frac{1}{5}$ in. to $\frac{1}{10}$ in. in length, and have one or two teeth on each side, by its long erect peduncles, and rather large flowers. Probably *V. Lyallii* is its nearest ally, but the habit is very different, being much more diffuse and erect, the leaves are larger, and the peduncles are shorter. It does well in cultivation, flowering quite freely.

PLATE 157. *Veronica Bidwillii*, drawn from specimens collected in the Hooker Valley, Mount Cook district, at an altitude of 2,500 ft. Fig. 1, portion of branch, with leaves ($\times 3$); 2, a pair of flowers ($\times 3$); 3, calyx and ovary ($\times 3$); 4, corolla laid open ($\times 4$); 5, capsule, a portion of the persistent calyx removed ($\times 3$).



I. Smith del
N. Fitch lith

West, Newman imp.

OURISIA SESSILIFOLIA, Hook. f.

PLATE 158.—OURISIA SESSILIFOLIA.

FAMILY SCROPHULARIACEÆ.]

[GENUS OURISIA, COMM.

Ourisia sessilifolia, Hook. f. *Handb. N.Z. Fl.* 218; *Cheesem. Man. N.Z. Fl.* 550.

Ourisia, which is a genus of between twenty or thirty species, is of particular interest to those engaged in the study of the origin of the New Zealand flora, the home of the genus being in the Andes of South America, where it ranges from New Grenada to the Strait of Magellan. But notwithstanding the distance separating the two countries it has established itself in New Zealand, where at least eight species are known: and a solitary species also occurs in Tasmania. As we cannot suppose that the genus has originated independently in the three countries, it becomes a nice question how to account for its presence in localities separated by such immense distances of ocean.

Sir Julius von Haast, who was the first to collect so many of the species composing the alpine flora of Canterbury, discovered *O. sessilifolia* on Mount Brewster, to the north of Lake Wanaka, in January, 1863. Subsequent botanists have observed it in many localities in the alpine centre of the South Island, from the Kaikoura Mountains on the east and the Paparoa Range on the west, southwards to the south-west of Otago. It also reappears on the summit of Mount Anglem, Stewart Island. It is a high alpine, and is rarely seen below 4,000 ft.

In the Mount Cook district *O. sessilifolia* is an abundant plant on most of the mountains, forming large patches on the sides of moist sheltered hollows, where it must be covered by a considerable depth of snow in the winter and spring months. In such situations it is associated with other alpine plants, such as *Celmisia Hectori*, *Ranunculus sericophyllus*, *Caltha novæ-zelandiæ*, *Rostkovia gracilis*, *Carex pyrenaica*, &c. It is most abundant at an altitude of about 5,000 ft., but ascends to quite 6,500 ft., and possibly higher. Its habit is peculiar, the lower portion of the stem being creeping and rooting, the leaves being practically bifarious and closely appressed to the surface of the ground. The stout peduncle is often 6 in. in height, and bears numerous large white flowers, which shade into dark violet towards the base. When in full flower it is thus a most charming and attractive plant.

Almost all the species of *Ourisia* found in New Zealand are well worth cultivation in gardens, even if a little additional trouble is required to grow them to advantage. The two larger species, *O. macrocarpa* and *O. macrophylla*, are among the finest herbaceous plants known in New Zealand, and their cultivation does not seem to present any extraordinary difficulties. The late Mr. H. J. Matthews grew both of them to perfection in his garden at Morningson, near Dunedin, together with most of the smaller species, including *O. sessilifolia*.

PLATE 158. *Ourisia sessilifolia*, drawn from specimens collected in the Mount Cook district, at an altitude of 5,500 ft. Fig. 1, bract ($\times 2$); 2, calyx ($\times 3$); 3, hairs from the calyx ($\times 8$); 4, corolla laid open ($\times 3$); 5 and 6, back and front view of anthers ($\times 6$); 7, ovary, with style and stigma ($\times 4$); 8, transverse section of ovary ($\times 5$).



M. Smith del.
J. N. Pritch lith.

West, Newman imp.

A. *UTRICULARIA NOVAE-ZEALANDIAE*, Hook. f. 1-8.
B. *UTRICULARIA DELICATULA*, Cheesem. 9-19.

PLATE 159.—UTRICULARIA NOVÆ-ZELANDIÆ AND UTRICULARIA DELICATULA.

FAMILY LENTIBULARIACEÆ.]

[GENUS UTRICULARIA, LINN.

Utricularia novæ-zelandiæ, Hook. f. *Fl. Nov. Zel.* i, 206; *Cheesem. Man. N.Z.* Fl. 560.
Utricularia delicatula, *Cheesem. Man. N.Z.* Fl. 561.

The genus *Utricularia* has been comparatively neglected in New Zealand, and the distribution of the species is consequently imperfectly known. *U. novæ-zelandiæ*, one of the two species figured in this plate, was first collected by Mr. Colenso in 1845 on "wet rocks at Palliser Bay," and was published by Sir J. D. Hooker in the "Flora Novæ Zelandiæ." It does not seem to have been observed again until 1867, when Mr. T. Kirk and Captain Hutton gathered it on the Great Barrier Island. Since then it has been observed by myself at Lake Ohia, in Mongonui County; by Mr. W. T. Ball and myself at Taupaki, on the Kaipara Railway; near Waiuku, by Mr. Carse; at Waihi, by Mr. Petrie; near Lake Taupo, by Mr. A. Hamilton; and in the Ngairu Swamp (Taranaki), by myself. It has also been recorded by Mr. J. B. Armstrong from the Canterbury Plains in swamps near the sea, but I have seen no specimens, and consequently cannot be positive that the species has been correctly identified.

U. delicatula was discovered by myself in 1880, in the extensive swamps near Ohaupo, in the Middle Waikato district, but at that time I confounded it with *U. Colensoi*. It was not until 1896, when I gathered it in abundance at Mangatete, near Kaitaia, that its distinctness from that species was satisfactorily established. More recently Mr. H. Carse has observed it in two or three other localities near Kaitaia, and in swamps between Waiuku and the Manukau Harbour.

Of the six species of the genus at present known in New Zealand, two (*U. protrusa* and *U. Mairii*) fall into the section *Natantes*, all the species of which have floating stems and submerged multifid leaves. The remainder belong to the section *Limosa*, composed of plants growing in bogs, and which bear few radical leaves, which may disappear altogether at the flowering period, and erect leafless scapes or peduncles with one or few or many flowers.

Utricularia novæ-zelandiæ can be distinguished from all its allies by the pale-purple flowers with a yellow eye; by the upper lip of the corolla being truncate or very slightly retuse at the tip, never 2-lobed; by the lower lip being very broad and entire, and furnished with three broad raised ridges, each of which is longitudinally grooved; and by the short thick obtuse spur. *U. delicatula* is smaller in all its parts, and the flowers are white with a faint yellow eye. The upper lip of the corolla is conspicuously 2-lobed at the tip; the lower is quite entire, and has no trace of the raised longitudinal ridges so obvious in *U. novæ-zelandiæ*; and the spur is longer and narrower, and minutely 2-horned at the tip. It agrees with *U. Colensoi*, so far as that species is known, in the shape of the upper lip, but differs altogether in the lower lip, which in *U. Colensoi* is described as "broadly cuneate, 3-lobed, middle lobe retuse, disc with three gibbous prominences," all being characters non-existent in *U. delicatula*. The remaining species of the section *Limosa* found in New Zealand (*U. monanthos*) can be separated at a glance from both *U. delicatula* and *U. novæ-zelandiæ* by the larger violet-purple flowers, broadly cuneate upper lip, very broad semicircular lower lip, and short obtuse spur.

PLATE 159A. *Utricularia novæ-zelandiæ*, drawn from specimens collected in *Sphagnum* bogs near Waihi, Ohinemuri County. Fig. 1, bladder borne on the roots ($\times 7$); 2 and 3, different views of flower ($\times 4$); 4, flower, with the corolla removed ($\times 6$); 5 and 6, stamens ($\times 10$); 7, ovary, with style and stigma ($\times 10$); 8, ripe fruit ($\times 3$).

PLATE 159B. *Utricularia delicatula*, drawn from specimens collected in *Sphagnum* swamps near Kaitaia, Mongonui County. Fig. 9, creeping stem with leaves and bladders ($\times 2$); 10 and 11, different views of a bladder ($\times 8$); 12, flower ($\times 4$); 13, flower, with the corolla removed ($\times 5$); 14, upper lip of corolla, with stamens and pistil ($\times 6$); 15 and 16, stamens ($\times 10$); 17, ovary, style, and stigma ($\times 10$); 18, ripe capsule ($\times 3$); 19, section of same, showing seeds ($\times 4$).



M. Smith del.
J.N. Fitch lith

West, Newman imp

RHABDOTHAMNUS SOLANDRI, A. Cunn.

PLATE 160.—RHABDOTHAMNUS SOLANDRI.

FAMILY GESNERACEÆ.]

[GENUS RHABDOTHAMNUS, A. CUNN.

Rhabdothamnus Solandri, A. Cunn. *Precur.* n. 385; *Cheesem. Man. N.Z. Fl.* 562.

The family *Gesneraceæ* reaches its southern limit in New Zealand, where it is represented by the subject of this plate, a monotypic genus allied to the Lord Howe Island *Negria* and the New Caledonian *Coronanthera*. All three are not very far removed from the huge Malayan and Pacific genus *Cyrtandra*, of which almost every island in Polynesia possesses its peculiar species.

Rhabdothamnus Solandri was originally discovered by Banks and Solander in Mercury Bay (or Oporagi, as Solander called it) during Cook's first visit to New Zealand. It was fully described and figured in Solander's manuscript "*Primitiæ Floræ Novæ Zelandiæ*" under the name (which was never actually published) of *Columnnea scabrosa*. It does not seem to have been noticed again until Allan Cunningham's first visit in 1826, when he gathered it in the Bay of Islands and Whangaroa districts. Subsequent research has proved that it is an abundant plant all through the northern portion of the North Island, from the North Cape southwards, but that it becomes rare and local to the south of Taranaki, although it has been recorded from various localities almost as far south as Cook Strait. Its altitudinal range is from sea-level to about 2,000 ft.

R. Solandri is a much-branched shrub seldom more than 4 ft. or 5 ft. high, everywhere rough to the touch from a covering of minute short and stiff conical hairs. It is usually found on the shaded sides of wooded ravines, where the forest is comparatively open and the soil dry and often shingly. It is also frequently seen on wooded declivities by the seashore. It has slender spreading often intertwined branches, and dull-green broadly ovate or orbicular coarsely toothed leaves. The flowers are decidedly handsome, $\frac{3}{4}$ in. to 1 in. in length, orange with red stripes, and are produced in succession during the major portion of the year.

The pollination of *Rhabdothamnus* has been described in detail by Mr. Petrie in a paper printed in the "*Transactions of the New Zealand Institute*" (vol. xxxv, p. 321). He points out that the flowers are proterandrous, the stigma being quite immature when the anthers are discharging their pollen, thus making the fertilization of the flower by its own pollen practically impossible. Further, there is a curious change in the position of the anthers after they have wholly or partly shed their pollen. When dehiscence commences they are so situated that a bird thrusting its head into the flower cannot avoid being plentifully dusted with pollen. At a later period the anthers move until they are in contact with the lower lip of the corolla, the now mature stigma occupying almost the same position that the anthers previously held. It follows from the above that fertilization is probably effected by birds carrying the pollen from recently expanded flowers and depositing it on the stigmas of much older flowers.

PLATE 160. *Rhabdothamnus Solandri*, drawn from specimens collected on the Waitakerei Ranges, near Auckland. Fig. 1, portion of leaf, showing its covering of short conical hairs ($\times 5$); 2, hairs still further enlarged; 3, calyx, with ovary and style ($\times 2$); 4, corolla laid open ($\times 2$); 5, anthers ($\times 6$); 6, ovary ($\times 4$); 7, transverse section of ovary ($\times 4$); 8, fruit ($\times 3$).





M. Smith del.
J. N. Fitch lith.

VITEX LUCENS, *T. Kirk.*

West, Newman imp.

PLATE 161.—VITEX LUCENS.

(THE PURIRI.)

FAMILY VERBENACEÆ.]

[GENUS VITEX, LINN.

Vitex lucens, T. Kirk in *Trans. N.Z. Inst.* xxix (1897), 525; *Cheesem. Man. N.Z. Fl.* 565. *V. littoralis*, A. Cunn. *Precur.* n. 390 (not of Decaisne); Hook. f. *Fl. Nov. Zel.* i, 203.

It was to be expected that such an important and conspicuous tree as the puriri should attract the notice of the earliest European visitors to the Dominion, and hence it is not at all surprising to learn that Sir Joseph Banks and Dr. Solander collected it at Tolaga Bay as far back as 1769 during Cook's first visit to New Zealand. The plant was excellently described by Solander in his manuscript "Primitiæ Floræ Novæ Zelandiæ" under the name of *Ephielis pentaphylla*, and a drawing of considerable artistic merit was also prepared. It is a matter of common knowledge that Solander's descriptions and drawings, prepared 140 years ago, still remain inedited and unpublished in the botanical department of the British Museum so far as the New Zealand species are concerned. Sir J. D. Hooker, in the introduction to the "Flora Novæ Zelandiæ," published in 1853, well remarks that their non-publication was "a national loss, and to science a grievous one, since had it been otherwise the botany of New Zealand would have been better known fifty years ago than it is now."

After Cook's time *V. lucens* does not seem to have been noticed by any botanist until Allan Cunningham's visit in 1826, when he observed it on the "rocky shores of the Bay of Islands, growing frequently within the range of salt water." Cunningham correctly referred it to the genus *Vitex*, publishing it in his "Precursor" under the name of *V. littoralis*. Unfortunately, he overlooked the fact that four years previously the same name had been used by Decaisne for a Malayan species. The first beginnings of European settlement brought to light the economic value of the plant, and soon led to the knowledge that it had a wide distribution in the northern portion of the North Island. It is now known to be an abundant plant from the North Cape to the Waikato and Upper Thames, and from thence in small numbers southwards to Mahia Peninsula on the east coast and Cape Egmont on the west. Its altitudinal range is from sea-level to 2,500 ft. In 1895 the publication of the fourth volume of the "Index Kewensis" drew attention to the fact that Cunningham's name was preoccupied, and Mr. Kirk consequently proposed that of *V. lucens*. It may be regretted, however, that he did not use that of *pentaphylla*, proposed in Solander's manuscripts 142 years ago.

The puriri is a large handsome tree of somewhat irregular growth, attaining a height of from 40 ft. to 60 ft., or even more, with a massive trunk 3 ft. to 5 ft. in diameter. It has a broad spreading crown of branches, and when forming small groves, which it often does in rich warm soils, presents a very attractive and ornamental appearance. The demand for its timber, however, has caused many of these clumps to disappear under the attacks of the bushman's axe. The leaves are on long stout petioles, and are digitately divided into 3 to 5 dark-green and glossy leaflets 2 in. to 5 in. long. The flowers are abundantly produced, and are arranged in axillary panicles. They are of a dull-red colour, and about 1 in. in length. The calyx is cup-shaped, truncate or very obscurely toothed; and the corolla is 2-lipped, with an arched upper lip, and a deflexed 3-lobed lower one. The drupe is bright red, globose, about $\frac{3}{4}$ in. diameter, and has a 4-celled stony endocarp; but it is rare for more than one or two of the cells to produce perfect seed.

The puriri produces the most valuable hardwood of any New Zealand tree. It is of a dark-brown colour, very hard, dense and heavy, and of great strength, but is, unfortunately, difficult to work on account of the irregular "grain" of the timber. Its durability is unquestioned, and it is consequently largely employed for railway-sleepers, gate and fencing posts, house-blocks, the framework of bridges, and for any other purpose demanding strength, solidity, and the power of resisting decay. Of late years it has been employed for furniture and cabinet-work, and if carefully picked is quite equal to the best Italian or American walnut. For this purpose, however, a serious defect exists in its liability, while living, to the attacks of the larva of the "puriri-moth" (*Hepialus virescens*), which bores galleries through it in all directions, the holes being large enough to admit the finger. They are often sufficiently numerous to make it difficult to obtain baulks of any size free from them, but they do not affect the durability of the timber.

Vitex lucens is a tree of fairly rapid growth on good soils, and on account of its ornamental appearance and umbrageous habit is now being largely planted in gardens and plantations in the northern part of the North Island, and should be still more extensively employed. It is too liable to injury from frost to succeed in the South Island, save in certain exceptional localities.

It is perhaps worth mention that the curious little pits or "domatia" first described by me on the under-surface of the leaves in *Coprosma* (Trans. N.Z. Inst. xix (1887), p. 221) also exist on the under-surface of the leaves of *Vitex lucens*, and in the same situation—that is, in the axil formed by the union of the primary veins with the midrib. As in *Coprosma*, they are often inhabited by a minute yellowish acarid.

PLATE 161. *Vitex lucens*, drawn from specimens gathered in the vicinity of Auckland. Fig. 1, portion of under-surface of leaf, showing the little pits or "domatia" situated in the axils of the veins ($\times 3$); 2, calyx laid open ($\times 1\frac{1}{2}$); 3, corolla laid open (natural size); 4 and 5, front and back view of anthers ($\times 3$); 6, transverse section of ovary ($\times 4$); 7, longitudinal section of same ($\times 4$); 8, section of fruit ($\times 1\frac{1}{2}$).



West, Newman imp.

M. Smith del.
J. N. Fitch lith.

SCUTELLARIA NOVAE-ZELANDIAE, Hook. f.

PLATE 162.—SCUTELLARIA NOVÆ-ZELANDIÆ.

FAMILY LABIATÆ.]

[GENUS SCUTELLARIA, LINN.

Scutellaria novæ-zelandiæ, Hook. f. *Fl. Nov. Zel.* ii, 335; *Handb. N.Z. Fl.* 226; *Cheesem. Man. N.Z. Fl.* 568.

Scutellaria is one of the most distinct of the genera of *Labiata*, easily recognized by the posticous lip of the calyx bearing on its back a hollow scale or pouch, both lip and scale being deciduous in fruit, the antecous lip alone being persistent. In addition to this strongly marked character, the flowers are not arranged in verticils, but are opposite; and the ovary is seated on a distinct stalk. The single New Zealand species is endemic, but is closely allied to the Australian *S. humilis*.

S. novæ-zelandiæ was originally discovered by Mr. J. C. Bidwill at Foxhill, in the Nelson Provincial District, about the year 1845. It was subsequently collected in the same locality by Sir D. Monro and other botanists, and was also found in various stations near Nelson by Mr. W. T. L. Travers, Mr. J. Buchanan, Mr. T. Kirk, Mr. F. G. Gibbs, and myself. At a later date Mr. J. H. Macmahon observed it in the Pelorus and Tinline Valleys, on the Marlborough side of the Dun Mountain Range. As these are the only localities of which there is any certain knowledge, it appears that the plant is confined to a district of less than twenty-five miles radius from the Town of Nelson. It descends almost to sea-level in the Maitai Valley, and I have not seen it at a higher altitude than about 500 ft. It should perhaps be mentioned that in 1877 Mr. J. B. Armstrong recorded it from Banks Peninsula, and that a few years earlier Mr. Purdie reported its existence on Flagstaff Hill, near Dunedin. But no subsequent observer has seen it in these localities, and I suspect that the records are due to some error of identification.

S. novæ-zelandiæ is a slender sparingly branched herb creeping and rooting at the base, but erect or ascending above. It varies much in size: I have seen specimens nearly 18 in. high, although the average stature is much less. The leaves are in distant pairs on slender petioles, the blade being $\frac{1}{4}$ in. to $\frac{1}{2}$ in. long, ovate to broadly oblong or orbicular, and with three to five shallow lobes or crenatures. The flowers are about $\frac{1}{2}$ in. long, white, solitary in the axils of the upper leaves, and the corolla is pubescent on the outside. I am not aware that it has ever been tried in cultivation.

PLATE 162. *Scutellaria novæ-zelandiæ*, drawn from specimens collected at Foxhill, Nelson. Fig. 1, flower ($\times 4$); 2, section of calyx, passing through the pouch on the posticous lip ($\times 6$); 3, corolla laid open ($\times 4$); 4, 1-celled anther ($\times 12$); 5, 2-celled anther ($\times 12$); 6, fruit ($\times 3$); 7, nutlets, with their gynophore ($\times 5$).



M. Smith del.
J.N. Pritch lith.

West, Newman imp.

PLANTAGO RAOULII, Deane.

PLATE 163.—PLANTAGO RAOULII.

FAMILY PLANTAGINACEÆ.]

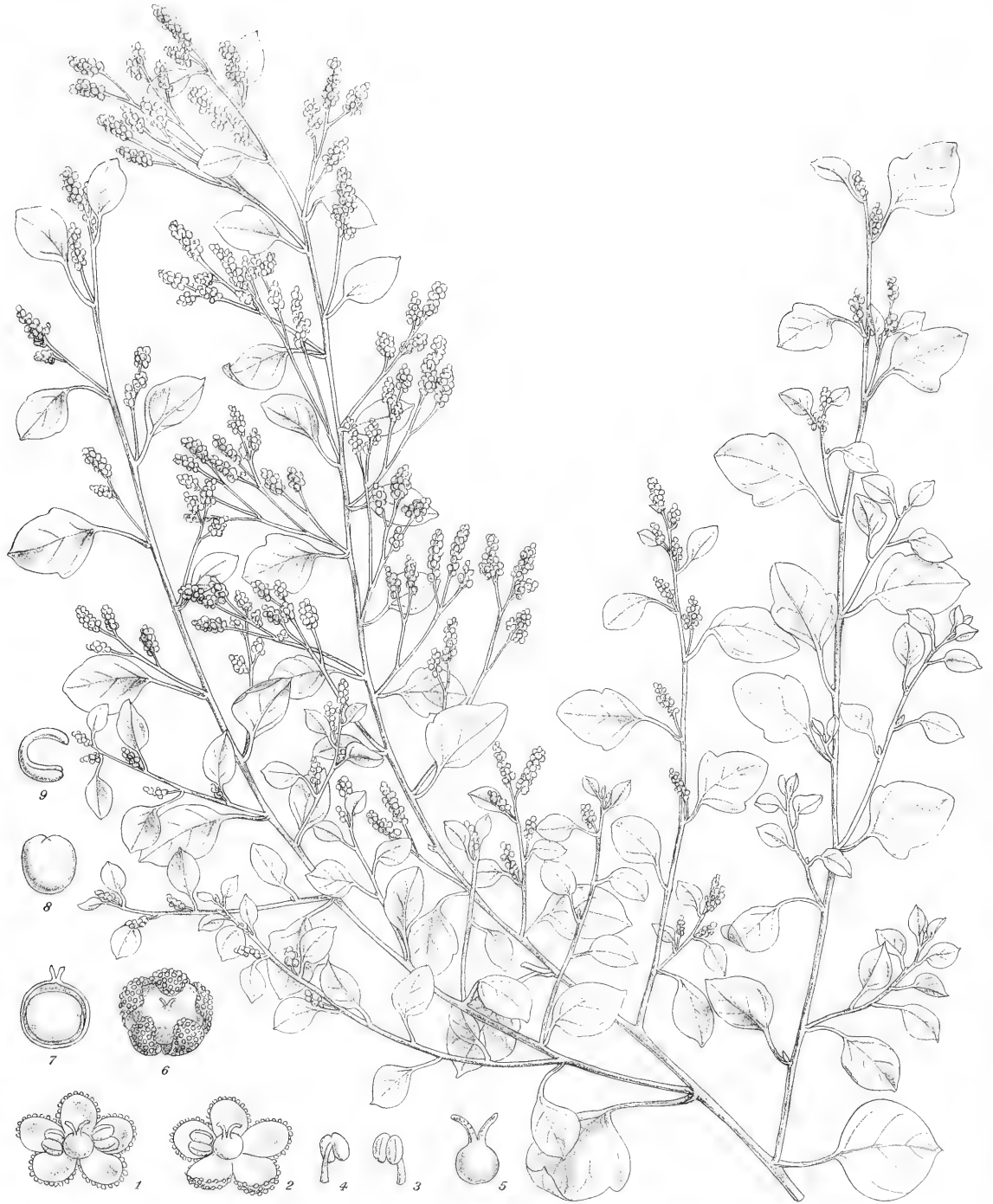
[GENUS PLANTAGO, LINN.

Plantago Raoulii, Deene, in *D.C. Prodr.* xiii, i, 703; *Cheesem. Man. N.Z. Fl.* 570.

The genus *Plantago* is well represented in New Zealand, no less than seven species being known, of which all but one are endemic. *P. Raoulii*, which I have selected for illustration in this work, was first gathered by Banks and Solander in Queen Charlotte Sound, near Picton, in January, 1770. A good description is given in Solander's manuscripts under the name of *P. erecta*, and a very accurate drawing is included among the unpublished Banksian plates. The next botanist to collect the species was Richard Cunningham, who in 1834 obtained it in the Bay of Islands district. His specimens were referred by his brother Allan to the Australian *P. varia*, and appeared under that name in the "Precursor." The mistake is not to be wondered at, the two species being very closely allied. In 1840 the French botanist Raoul gathered it at Akaroa, and his specimens passing under the hands of Decaisne, then the unchallenged authority on the genus, the species was published under the name of *P. Raoulii*.

P. Raoulii has a very extensive distribution within the Dominion, ranging from the North Cape to Stewart Island. It is most abundant on moist ground near the sea, but is also found inland, and ascends to well over 3,000 ft. Its nearest ally is probably the Australian *P. varia*.

PLATE 163. *Plantago Raoulii*, drawn from specimens collected near Hawera, Taranaki. Figs. 1 and 2, flowers ($\times 6$); 3 and 4, front and back view of anthers ($\times 10$); 5, ovary and style ($\times 6$); 6, transverse section of ovary ($\times 7$); 7, longitudinal section of ovary ($\times 7$); 8, placenta ($\times 8$); 9, ripe capsule ($\times 4$); 10, placenta ($\times 6$); 11, upper seed ($\times 8$); 12, one of the lower seeds ($\times 8$).



M. Smath del.
J.N. Fitch lith.

West, Newman imp.

CHENOPODIUM TRIANDRUM, *Forst.*

PLATE 164.—CHENOPODIUM TRIANDRUM.

FAMILY CHENOPODIACEÆ.]

[GENUS CHENOPODIUM, LINN.

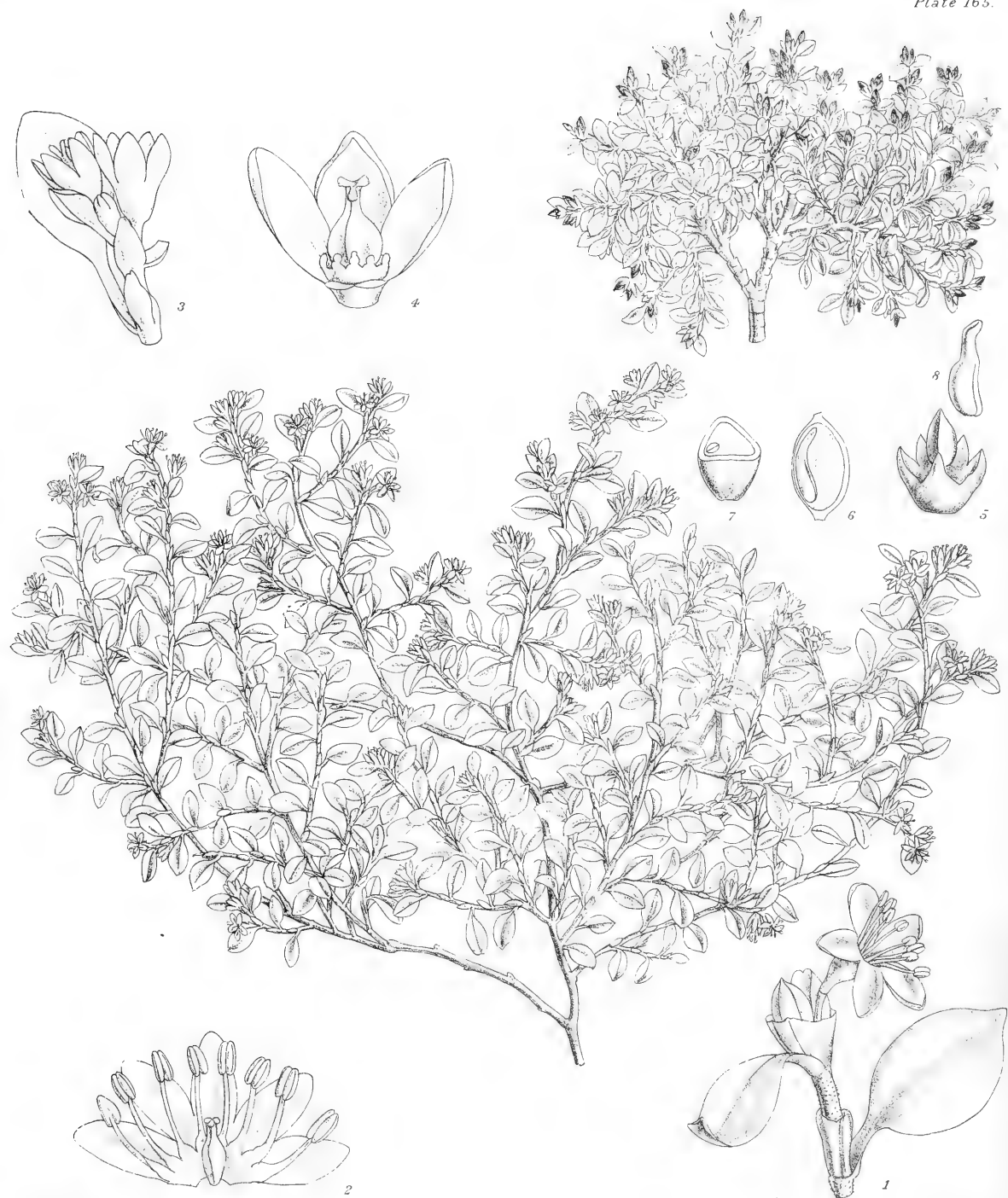
Chenopodium triandrum, Forst. Prodr. n. 129; Cheesem. Man. N.Z. Fl. 580.

Seven species of *Chenopodium* are recorded as inhabitants of New Zealand, but it is highly doubtful whether all of them are indigenous. *C. urbicum* and *C. ambrosioides* are known in many countries as weeds of way-sides and cultivations, and as they are never found out of such situations in New Zealand it seems most reasonable to look upon them as introductions received by way of Australia and the Bay of Islands in the early days of the Dominion. *C. carinatum*, which is a native of Australia and New Caledonia, was originally found in New Zealand by Allan Cunningham "on the sandy shores of the Bay of Islands," and can still be noticed in similar habitats in the North Auckland Peninsula. But it is more commonly seen as a weed in rich warm cultivated soils, and probably should be placed in the same category as the two preceding. The nativity of the four remaining species—*C. triandrum*, *C. glaucum*, *C. detestans*, and *C. pusillum*—cannot be questioned.

C. triandrum was originally discovered by Banks and Solander in Mercury Bay during Cook's first voyage, and was figured in the series of plates of New Zealand plants prepared more than 140 years ago under the direction of Dr. Solander, but never actually published. It was also gathered by the Forsters in Queen Charlotte Sound during Cook's second voyage, and was described by George Forster in his "Prodromus" under the name it still bears. In 1827 it was collected by D'Urville in Astrolabe Harbour, Nelson, and since then has been observed in many localities on the coast-line of both the North and the South Islands, from the Bay of Islands to Foveaux Strait.

C. triandrum is a prostrate or trailing plant, usually found on the faces of maritime cliffs or in sandy nooks at their bases. Occasionally it may be observed inland—for many years a large patch existed near the summit of Mount Wellington, on the Auckland Isthmus, but has become extinct of late years. It has been recorded by Mr. Petrie from various saline localities in Central Otago, at considerable distances from the sea, where it occurs in company with other well-known coastal plants. It very closely resembles *Rhagodia nutans*, but the bright-red fleshy fruit of this latter plant is unmistakable and at once separates the two species; and, in addition, *Rhagodia* has much more woody stems and branches, the leaves are thicker and usually smaller, and generally more or less cordate at the base, and the flowers are not nearly so numerous.

PLATE 164. *Chenopodium triandrum*, drawn from specimens collected on the Little Barrier Island. Fig. 1, flower with two stamens ($\times 10$); 2, flower with one stamen ($\times 10$); 3 and 4, front and back view of anther ($\times 12$); 5, ovary and styles ($\times 15$); 6, ripe fruit ($\times 8$); 7, section of same, showing seed ($\times 8$); 8, seed ($\times 8$); 9, embryo ($\times 8$).



M. Smith del.
J. N. Fitch lith.

West. Newman imp.

MUEHLENBECKIA AXILLARIS, Hook. f.

PLATE 165.—MUEHLENBECKIA AXILLARIS.

FAMILY POLYGONACEÆ.]

[GENUS MUEHLENBECKIA, METSSN.

Muehlenbeckia axillaris, Walp. Ann. i, 552; Hook. f. Handb. N.Z. Fl. 236; Cheesem. Man. N.Z. Fl. 593.

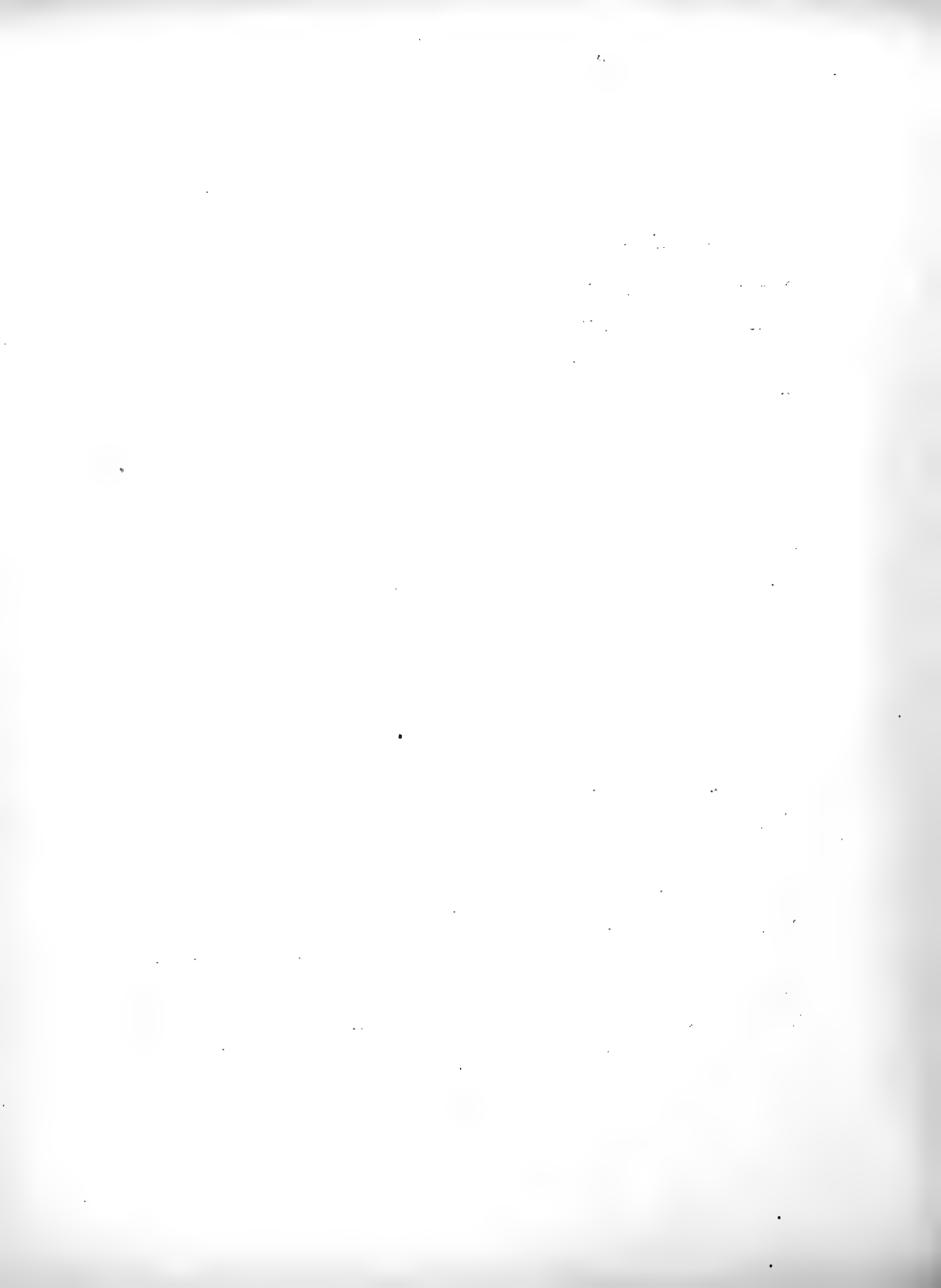
Polygonum axillare, Hook. f. in Hook. Lond. Journ. Bot. vi (1847), 278.

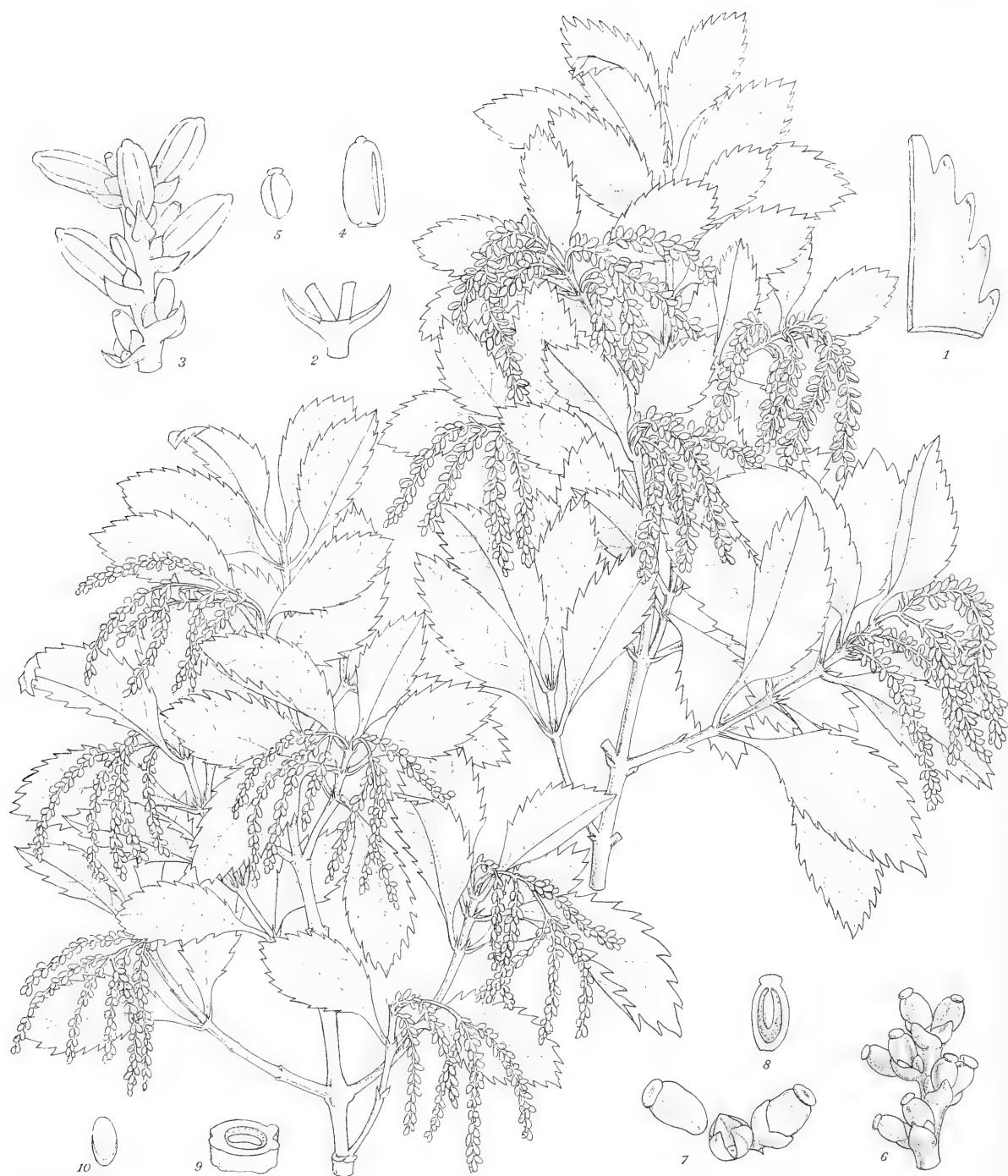
Muehlenbeckia axillaris was originally discovered by Mr. Colenso in the Wairarapa district in 1846, and in the following year was described by Sir J. D. Hooker in the *London Journal of Botany* under the name of *Polygonum axillare*. It was soon found to have a wide distribution in the mountain districts of both Islands, from the East Cape and Taupo southwards to Foveaux Strait, but so far has not been recorded from Stewart Island. It descends to sea-level or nearly so in several parts of the Dominion, but is most abundant between 1,000 ft. and 3,000 ft. elevation. It is one of the plants nearly always seen in the open river-valleys of the interior of the South Island, or at the base of the shingle-slopes which so commonly cover broad stretches of the steep mountain-sides. But its habitats are really of a varied character. For instance, on the central volcanic plateau of the North Island it occurs plentifully in the shingly or grassy valleys which radiate from Tongariro or Ruapehu, on the lower slopes of the mountains, in profusion on the sandy waste to the east of Ruapehu known as the Onetapu Desert, and in not a few localities on the pumice soils of the open Taupo plains.

Muehlenbeckia axillaris varies greatly in size and to some extent in mode of growth. The primary stems creep just under the surface of the ground, or among loose stones, putting up numerous branches which usually form a dense matted carpet seldom rising much above the ground. The patches may vary from 2 in. or 3 in. to 12 in. or 18 in. in diameter, or even more, and, although generally dense, are sometimes lax and open. The leaves vary in size from $\frac{1}{16}$ in. to $\frac{1}{3}$ in. in length, but in shape are tolerably constant. The flowers are solitary and axillary, or 2 to 3 together. Like all the New Zealand species, the fruit is usually enclosed in the enlarged white and succulent perianth, but it is quite common to find specimens in which the perianth is practically dry and unaltered in fruit.

The nearest ally of *M. axillaris* is undoubtedly *M. complexa*; but it can easily be distinguished from all the forms of that variable plant by the much smaller size, much more depressed habit, smaller and more uniform leaves, and by the flowers being either solitary or few together.

PLATE 165. *Muehlenbeckia axillaris*, drawn from specimens collected in the Hooker Valley, Mount Cook district, at an elevation of 2,500 ft. Fig. 1, branchlet bearing an expanded male flower and a young bud ($\times 5$); 2, male perianth laid open ($\times 8$); 3, branchlet, with female flowers ($\times 5$); 4, section of female perianth ($\times 8$); 5, nut enclosed in the enlarged and succulent perianth ($\times 3$); 6, longitudinal section of nut ($\times 5$); 7, transverse section of nut ($\times 5$); 8, embryo ($\times 8$).





M. Smith del
J.N. Fitch lith.

West, Newman imp.

ASCARINA LUCIDA, Hook. f.

PLATE 166.—ASCARINA LUCIDA.

FAMILY CHLORANTHACEÆ.]

[GENUS ASCARINA, FORST.

Ascarina lucida, Hook. f. *Fl. Nov. Zel.* i, 228; *Cheesem. Man. N.Z. Fl.* 598.

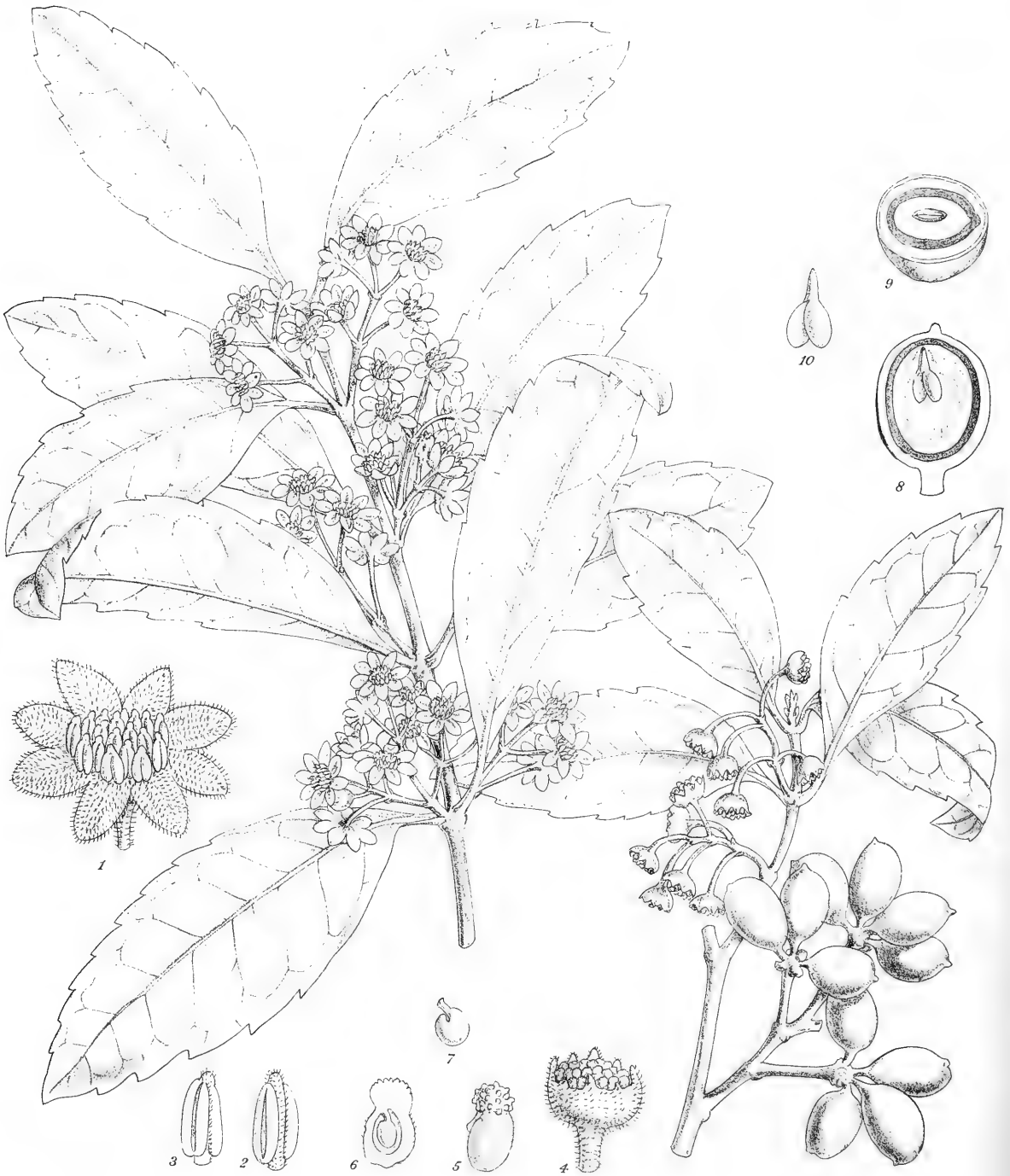
Although there are numerous evidences of Polynesian affinity in the New Zealand flora, there are only six genera which are absolutely confined to the two areas—*Melicytus*, *Corynocarpus*, *Meryta*, *Schefflera*, *Ascarina*, and *Eurina*. From the point of view of plant distribution *Ascarina* is perhaps the most interesting of these, for it belongs to a family (*Chloranthaceæ*) which is not found in any part of Australia, and which, together with *Coriariaceæ*, constitute the only families of the New Zealand flora that do not occur in that country.

Six species of *Ascarina* are now known, all of them being very closely allied. The type of the genus is *A. polystachya*, Forst., which is apparently confined to Tahiti. *A. lanceolata*, originally described from the Kermadec Islands, has since been recorded by Seemann from the Fiji Islands, by Powell and others from Samoa, and by myself from Rarotonga. Three species at least occur in New Caledonia—*A. rubricaulis*, *A. alticola*, and *A. Solmsiana*. Finally, there is *A. lucida*, the subject of this plate, which only differs from *A. lanceolata* in the shorter, broader, and more obtuse leaves, and in the smaller anthers.

For the first discovery of *Ascarina lucida* we have to go back as far as January, 1770, when it was collected by Banks and Solander in Queen Charlotte Sound during Cook's first voyage. It was not seen again until 1846, when Mr. Colenso gathered it in swampy forests in the Wairarapa Valley. It has since been observed in a considerable number of localities between Hokianga in the north, and Stewart Island in the south, but is rarely seen in any quantity except on the western side of the South Island, where it appears to be abundant, especially in the Westport district, and in some of the Sounds on the south-west of Otago. The Stewart Island locality rests on the authority of Mr. T. Kirk, who appears to have examined specimens collected by Mr. C. Traill (see *Trans. N.Z. Inst.* xxix (1897), 539). It descends to sea-level at Cape Foulwind, near Westport; and I saw a solitary plant near the summit of the Little Barrier Island, at an altitude of about 2,200 ft.

Very little is known of the properties of *Ascarina*. Both *A. lucida* and *A. lanceolata* are highly aromatic; and in Samoa, according to Mr. Powell, the leaves of the latter were used for perfuming oils. It is quite possible that the Maoris may have used the leaves of *A. lucida* for imparting a pleasant scent to fat, just as they were in the habit of using the leaves of *Panax Edgerleyi* and other fragrant plants.

PLATE 166. *Ascarina lucida*, drawn from specimens collected by Mr. Townson at Cape Foulwind, near Westport. Fig. 1, margin of leaf ($\times 3$); 2, bracts ($\times 8$); 3, male inflorescence ($\times 5$); 4, anther ($\times 8$); 5, rudimentary pistil ($\times 5$); 6, female inflorescence ($\times 5$); 7, two female flowers, one with the pistil removed ($\times 8$); 8, longitudinal section of ovary ($\times 8$); 9, transverse section of ovary ($\times 8$); 10, ovule ($\times 10$).



M. Smith del.
J.N. Pritch lith.

West Newman imp.

HEDYCARYA ARBOREA, Forst.

PLATE 167.—HEDYCARYA ARBOREA.

FAMILY MONIMIACEÆ.]

[GENUS HEDYCARYA, FORST.

Hedycarya arborea, Forst. Char. Gen. 128, t. 64; Cheesem. Man. N.Z. Fl. 599.

The genus *Hedycarya*, with the exception of the Australian *H. angustifolia*, is entirely confined to western Polynesia and New Zealand. Fifteen species are known, of which no less than nine are restricted to New Caledonia. Two are found in the Fiji Islands, and one each in the Solomon Islands, Samoa, Australia, and New Zealand. The Australian and New Zealand species should therefore be regarded as solitary outliers of a genus whose main home is in New Caledonia and the adjacent islands.

We owe the first discovery of *Hedycarya* in New Zealand to Banks and Solander, who in October, 1769, gathered it at "Tigadu," now called Anaura Bay. Later on they also observed it at Tolaga Bay, Mercury Bay, and Queen Charlotte Sound. It was also collected by the two Forsters during Cook's second voyage, and was formally published by them in their "Characteres Genera Plantarum" under the name of *Hedycarya arborea*. Since then it has been observed by almost all botanists and explorers, and is known to be an abundant plant from the Three Kings Islands and the North Cape to the south of Otago, ranging from sea-level to over 2,000 ft.

Hedycarya arborea is a small compactly branched tree 15 ft. to 35 ft. in height, with a trunk 9 in. to 18 in. in diameter, or more. Although well known to the settler and woodsman it has no generally accepted local name, although I have heard it called "pigeonwood" and "New Zealand holly," the last-mentioned very unsuitable appellation being probably due to the bright-red colour of the ripe drupes. The Maoris call it indifferently kaiwhiria or porokaiwhiria. The wood is pale and soft, and probably useless; and I am not aware that the plant has been applied to any economic purpose. Forster's name of *Hedycarya* is usually supposed to have been given on account of the pleasant taste of the seeds, but I have never heard of their being eaten. The tree is of rapid growth, and is probably suitable for the mixed shrubbery, but so far has been little planted.

PLATE 167. *Hedycarya arborea*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, male flower ($\times 3$); 2 and 3, stamens ($\times 6$); 4, female flower ($\times 3$); 5, ovary ($\times 8$); 6, longitudinal section of same ($\times 8$); 7, ovule ($\times 10$); 8, longitudinal section of fruit ($\times 2$); 9, transverse section of same ($\times 2$); 10, embryo ($\times 4$).



BEILSCHMIEDIA TARAIRI, Benth & Hook. f.

West, Newman imp.

PLATE 168.—BEILSCHMIEDIA TARAIRI.

(THE TARAIRE.)

FAMILY LAURACEÆ.]

[GENUS BEILSCHMIEDIA, NEES.

Beilschmiedia Tarairi, Benth. & Hook. j. ex T. Kirk, Forest Fl. t. 43; Cheesem. Man. N.Z. Fl. 602.

Laurus Tarairi, A. Cunn. Precur. n. 351.

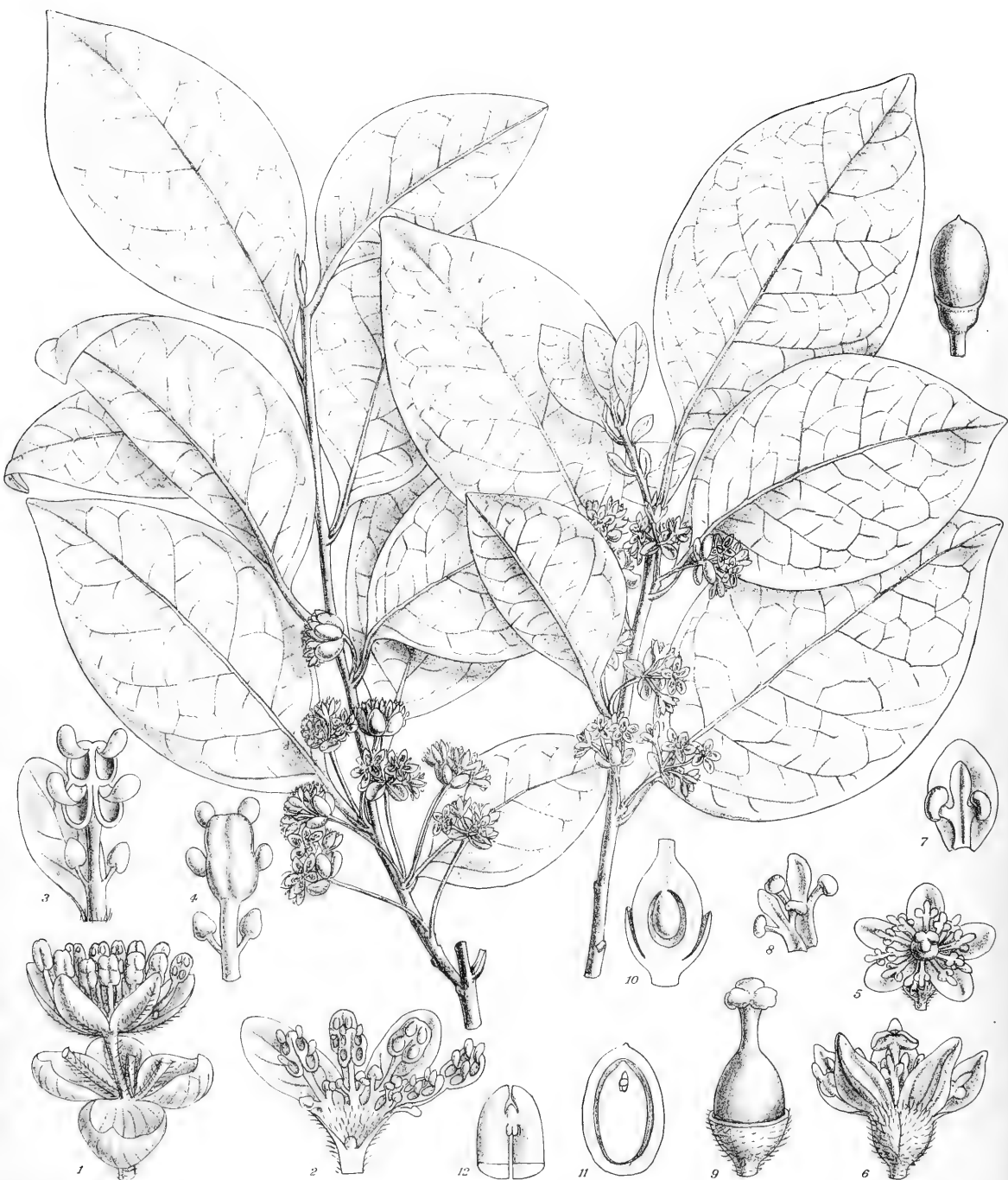
Few New Zealand trees are more familiar to the settler of the northern portion of the North Island than the subject of this plate, known to both Maori and European by its native name of taraire. The great abundance of the tree in many districts north of Auckland is doubtless the chief reason for this; but its remarkably distinct appearance, due to the slender, straight trunk, few short branches, and fine bold foliage, cannot fail to impress the observer, even in localities where it is comparatively rare.

In the "Flora Novæ Zelandiæ" Sir J. D. Hooker quotes Banks and Solander as the first collectors of the taraire. This I believe to be incorrect. It is not figured in the Banksian plates, there is no description that matches it in Solander's manuscripts, and there are no specimens in the set of Banksian plates presented to the Dominion by the Trustees of the British Museum. Its first discoverer, so far as I can ascertain, was the enthusiastic Allan Cunningham, who collected it in 1826 "in dry woods on the banks of rivers, Bay of Islands, Whangaroa, &c." In 1838 he described it in his "Precursor" under the name of *Laurus Tarairi*, an appellation which it retained until the publication of the "Flora Novæ Zelandiæ" in 1853, when Sir J. D. Hooker founded the genus *Nesodaphne* for its reception and that of its near ally the tawa. In 1880, however, *Nesodaphne* was merged by Hooker and Benthham in the "Genera Plantarum" with the Asiatic and African genus *Beilschmiedia*, a view which has also been adopted by Pax in Engler's "Pflanzenfamilien."

Beilschmiedia Tarairi has a limited range, being confined to the northern portion of the North Island, from the North Cape to Hicks Bay on the east coast, and to Raglan on the west. South of the Auckland Isthmus it is by no means common, and is often absent from wide districts; but from the Kaipara northwards to the Bay of Islands and Hokianga it is abundant, often constituting a large proportion of the forest. It prefers dry rich soils, and is most plentiful at moderate elevations. I have not myself seen it at a greater height than 1,700 ft., but I believe that it ascends to nearly 2,000 ft. on the plateau between the Northern Wairoa River and Hokianga.

The wood of the taraire is pale in colour, close-grained, and easily worked, but is deficient in strength and elasticity. It has the reputation of not being durable when exposed to the weather, but I am inclined to think that it is more lasting than is usually supposed. In any case, the timber should be serviceable for inside work, for the manufacture of white-wood furniture, tubs, buckets, &c., and it seems extraordinary that so little is done towards utilizing it in that direction. The large plum-like berries were formerly used by the Maoris as food, the kernels being steamed for a couple of days in an oven. The pulpy portion of the berries, though edible, is not at all palatable, and was seldom eaten except by children.

PLATE 168. *Beilschmiedia Tarairi*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, flower-bud ($\times 5$); 2, flower ($\times 5$); 3, perianth laid open ($\times 8$); 4, perianth-segment and stamen ($\times 9$); 5 and 6, front and back view of stamen ($\times 9$); 7, ovary ($\times 8$); 8, section of ovary ($\times 8$); 9, seed (natural size).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

LITSAEA CALICARIS, Benth & Hook f.

PLATE 169.—LITSÆA CALICARIS.

(THE MANGEAO.)

FAMILY LAURACEÆ.]

[GENUS LITSÆA, LAM.

Litsæa calicaris, Benth. & Hook. f. ex T. Kirk, *Forest Fl.* t. 10; *Cheesem. Man. N.Z. Fl.* 603.
Laurus calicaris, Sol. ex A. Cunn. *Precur.* n. 353.

Litsæa calicaris, the mangeao or tangeao of the Maoris and of most country residents, was discovered in 1769 by Sir Joseph Banks and Dr. Solander at the Bay of Islands, in a locality called by them Motuaro, but which is doubtless the same as the island at present known by the name of Motuarohia. An excellent description of the plant was prepared by Solander for his "Primitiæ Floræ Novæ Zelandiæ" under the name of *Laurus calicaris*, and a plate was also drawn under his superintendence for the illustrations intended to accompany the work; but, as is well known, neither Solander's descriptions nor his plates have ever been published. The two Cunninghams also observed the plant in the Bay of Islands district, and when Allan Cunningham prepared his "Precursor" for publication he adopted Solander's name. This it retained until Sir J. D. Hooker issued his "Flora Novæ Zelandiæ," when he transferred the species to the genus *Tetranthera*. In the third volume of the "Genera Plantarum," published in 1880, Hooker and Bentham made a further change by merging *Tetranthera* with *Litsæa*. Since then our plant has borne the name of *Litsæa calicaris*.

Litsæa is pre-eminently an Indian and Malayan genus, extending northwards to China and Japan, and southwards to New Guinea, Australia, the Pacific islands, and New Zealand, where it attains its southern limit. Although not absent from America or Africa, it is very feebly represented therein. The number of well-established species is probably not far short of 175.

The mangeao, as it is usually called, is a rather closely branched leafy tree from 30 ft. to 40 ft. or 45 ft. in height, with a trunk $1\frac{1}{2}$ ft. to $2\frac{1}{2}$ ft. in diameter. When it has ample room for growth the branches often spread considerably, forming a really handsome tree, but ordinarily it has a somewhat narrow head of branches. The wood is strong, tough, and elastic, and is generally recognized as suitable for all classes of coopers' or wheelwrights' work, or for ships' blocks, oars, shafts, panelling, &c.; but as large quantities can seldom be obtained in any one locality its use has not increased of late years.

The geographical range of the mangeao is very similar to that of the taraire, figured on the previous plate. It extends from the Three Kings Islands and the North Cape to Rotorua and the East Cape on the eastern side of the Island, and to Kawhia on the west. It is not, however, so abundant within its range as the taraire, seldom forming any considerable proportion of the forest. I have not noticed it at a higher elevation than 2,000 ft.

PLATE 169. *Litsæa calicaris*, male and female, drawn from specimens gathered in the vicinity of Auckland. Fig. 1, male inflorescence, showing the four involucreal leaves which surround the base of the umbel, and a single flower, three others having been removed ($\times 4$); 2, section of flower, showing stamens ($\times 6$); 3, perianth-segment with stamen, showing the anther opening by four valves ($\times 8$); 4, back view of anther ($\times 8$); 5, female flower, showing the perianth, staminodia, and pistil ($\times 4$); 6, side view of flower ($\times 5$); 7, perianth-segment, with rudimentary stamen ($\times 8$); 8, pair of rudimentary stamens ($\times 8$); 9, ovary, with style and stigma ($\times 8$); 10, section of ovary ($\times 8$); 11, longitudinal section of seed ($\times 1\frac{1}{2}$); 12, section of embryo (much enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

PERSOONIA TORU, A. Cunn.

PLATE 170.—PERSOONIA TORU.

FAMILY PROTEACEÆ.]

[GENUS PERSOONIA, SMITH.

Persoonia Toru, *A. Cunn. in Bot. Mag.* sub. t. 3513; *Cheesem. Man. N.Z. Fl.* 605.

Persoonia Toro, *Hook. f. Fl. Nov. Zel.* i, 219.

Persoonia Toru, the subject of this plate, was first collected by Allan Cunningham in 1826 near the shores of the Bay of Islands, and he subsequently observed it at Whangaroa and Hokianga, all three being districts in which it is still abundant. Cunningham described it in a note to t. 3513 of the *Botanical Magazine*, selecting as the specific name that which he then believed was applied to the plant by the Maoris. In his "Precursor," however, he changed the name to *Tora*; and Sir J. D. Hooker, in the "*Flora Novæ Zelandiæ*," again altered it to *Toro*. Mr. Colenso, whose intimate knowledge of the Maori language entitles his opinions on such matters to great respect, states that *Toru* is the correct appellation, and as it certainly has priority I adopted it in the Manual. At the same time, there is good reason to believe that in many districts *toro* was the name generally used by the Maoris.

Like the two preceding plants figured in this work, *Persoonia Toru* is a northern species, reaching its southern limit in the East Cape district. So far as I am aware, its northern boundary is at Mongonui and near Kaitaia, for in the three visits that I have made to the North Cape Peninsula I have failed to detect it in any station further to the north. From Mongonui southwards it is a not uncommon constituent of most forest districts, particularly on the outskirts of kauri forests, or in that peculiar association of small trees, or small individuals of large trees, that can often be observed in forest areas north of Auckland, and which is mainly composed of *Weinmannia sylvicola*, *Leptospermum ericoides*, *Fusanus Cunninghamii*, *Phyllocladus trichomanoides*, *Olearia Cunninghamii*, *Coprosma lucida*, *Leucopogon fasciculatus*, and others, and which gradually merges into the forest proper. This association often shelters multitudes of young kauris, and if left alone would form an admirable nursery for a kauri forest. South of Auckland the *toru* gradually becomes less plentiful, although it occurs in several localities in the Bay of Plenty, the Patetere Plateau, Rotorua, near Waiotapu, &c. The most southern locality that I am acquainted with is between Whangaparaoa and Hicks Bay, in the East Cape district, where it was observed by Bishop Williams several years ago.

The usual height of the *toru* when adult is from 25 ft. to 35 ft., but occasionally it reaches 40 ft. or even more. The trunk seldom exceeds 18 in. in diameter. When growing in the forest among other trees it is sparingly branched, and it is in such situations that it attains its greatest height. In the open it is closely and compactly branched, forming a very handsome and attractive large shrub or small tree. The wood is dark red with a pretty figure, and is occasionally employed in inlaying or veneering. As an ornamental shrub or tree it is well worth a place in any garden in the northern portion of the Dominion.

It is worthy of remark that the genus *Persoonia*, which now includes over seventy well-established species, is altogether confined to Australia, with the exception of the New Zealand plant.

PLATE 170. *Persoonia Toru*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, portion of inflorescence, showing two flowers and a bud ($\times 3$); 2, perianth-segment and stamen ($\times 7$); 3, anther ($\times 8$); 4, pistil ($\times 7$); 5, longitudinal section of ovary, showing a single ovule ($\times 7$); 6, a similar section, showing two ovules ($\times 7$); 7, section of fruit ($\times 2$); 8, seed ($\times 4$); 9, embryo ($\times 5$).



M. Smith del.
J.N. Fitch hth.

West, Newman imp.

KNIGHTIA EXCELSA, R.Br.

PLATE 171.—KNIGHTIA EXCELSA.

(THE REWAREWA.)

FAMILY PROTEACEÆ.]

[GENUS KNIGHTIA, R. BR.

Knightia excelsa, R. Br. in Trans. Linn. Soc. x (1810), 194, t. 2; Cheesem. Man. N.Z. Fl. 606.

Very few New Zealand trees have a more distinctive appearance than the subject of this plate, commonly known by its Maori name of rewarewa. Its tall and fastigate mode of growth, somewhat resembling that of the Lombardy poplar, its stiff and rigid erect branches, the coriaceous and almost woody leaves, and the conspicuous racemes of bright red-brown flowers, usually produced on the branches below the leaves, are well-marked characters not easily overlooked by the most incurious observer.

Like so many of the conspicuous lowland plants of New Zealand, we owe the first discovery of *Knightia* to Sir Joseph Banks and Dr. Solander, who in October, 1769, collected it at Tolaga Bay during Cook's first voyage. An excellent description and very characteristic plate were prepared from the specimens collected on this occasion, forming part of Solander's projected "*Primitiæ Floræ Novæ Zelandiæ*," a work which, to the great loss of botanical science, has remained unpublished for 140 years. In 1810 the well-known botanist Robert Brown established the genus *Knightia* for our plant, a name which it has retained until the present day. Two New Caledonian plants have been subsequently added to the genus, but they differ in the axillary and terminal racemes and large coloured deciduous bracts, and form the subgenus *Eucarpha*.

Knightia excelsa is an abundant tree throughout the greater part of the North Island, from the North Cape to Cook Strait. But although I have seen it as high as 2,800 ft., it is not common above an elevation of 2,000 ft., and is therefore absent from the higher forests of the central volcanic plateau, and from the similar forests on the flanks of the Ruahine and Tararua Mountains. With these exceptions, it might almost be said to be of general occurrence in the North Island. In the South Island its distribution is much more limited. So far as I am aware, it is confined to a few localities in Pelorus Sound and the other inlets of northern Marlborough, and to the vicinity of Croixelles Harbour, in Nelson.

With the exception of the *Coniferæ* and a few trees like the pukatea (*Laurelia*), *Knightia* is as tall as any of the trees constituting the New Zealand forest. Specimens between 80 ft. and 90 ft. high are comparatively common, and it is said to occasionally exceed 100 ft. The trunk ranges from 2 ft. to 3 ft. in diameter or sometimes slightly more. The wood is not durable in situations where it is exposed to the weather, although in the early days of the Dominion it was split into palings or even sawn into weatherboards. But for such purposes as inlaying, panelling, furniture and cabinet-work, and all kinds of ornamental turnery it is a very suitable and handsome timber. It is beautifully variegated, reddish on a light-brown ground, is of considerable strength, and takes a high finish.

The fertilization of the flowers of *Knightia* is well worth careful study. I have described it in detail in a memoir published in vol. 2 of the "Journal of the Australasian Association," but a short abstract may be useful here. The flowers are arranged in pairs on stout lateral racemes 2 in. to 4 in. long, each raceme containing from 40 to 80 flowers, or even more. Before expansion the perianth is cylindrical in shape, slightly swollen at the base and towards the apex. In the young bud there is no appearance of segments, but ultimately the top of the tube

splits into four small teeth, the apex of the style showing between. Later on the segments come apart at the base of the perianth, but for a long time they firmly cohere above the middle of the tube, the final separation always taking place suddenly and elastically, the four segments each coiling up into a spiral band, which is packed away at the base of the flower. The fully expanded racemes thus represent nothing more than a brush of long styles projecting from a mass of twisted perianth-segments. At the very base of the flower are four rounded glands which secrete an abundance of honey, which usually surrounds the base of the ovary. The flowers have a strong and peculiar odour, easily recognizable in the neighbourhood of a tree in full bloom. Just previous to expansion the anthers open and deposit the whole of their pollen on the surface of the thickened upper portion of the style, where it forms four little ridges. This looks like a simple case of self-fertilization, but a little examination proves that the stigma is not mature until some time after the expansion of the flower, and after the pollen has been removed. Clearly some means must therefore exist by which the pollen is regularly transferred from the younger to the older flowers. Further investigation has shown that this is done through the agency of honey-eating birds, such as the tui (*Prothemadera*) and korimako (*Anthornis*), which regularly frequent the flowers. It is obvious that the bird, in thrusting its head between the styles of a recently expanded raceme, must dust the feathers of the forehead and throat with pollen, and that when it visited older flowers the pollen would be rubbed off on the style, and probably smeared over the stigma.

PLATE 171. *Knightia excelsa*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, flower-bud just previous to expansion ($\times 1\frac{1}{2}$); 2, fully expanded flower, the perianth-segments coiled up spirally ($\times 1\frac{1}{2}$); 3, anther ($\times 3$); 4, longitudinal section of ovary ($\times 3$); 5, transverse section of same ($\times 3$); 6, seed (natural size); 7, the same ($\times 2$); 8, embryo ($\times 5$).



M. Smith del.
J. N. Fitch lith.

West. Newman imp.

PIMELEA LONGIFOLIA, Banks & Solander.

PLATE 172.—PIMELEA LONGIFOLIA.

FAMILY THYMELÆACEÆ.]

[GENUS PIMELEA, BANKS & SOL.

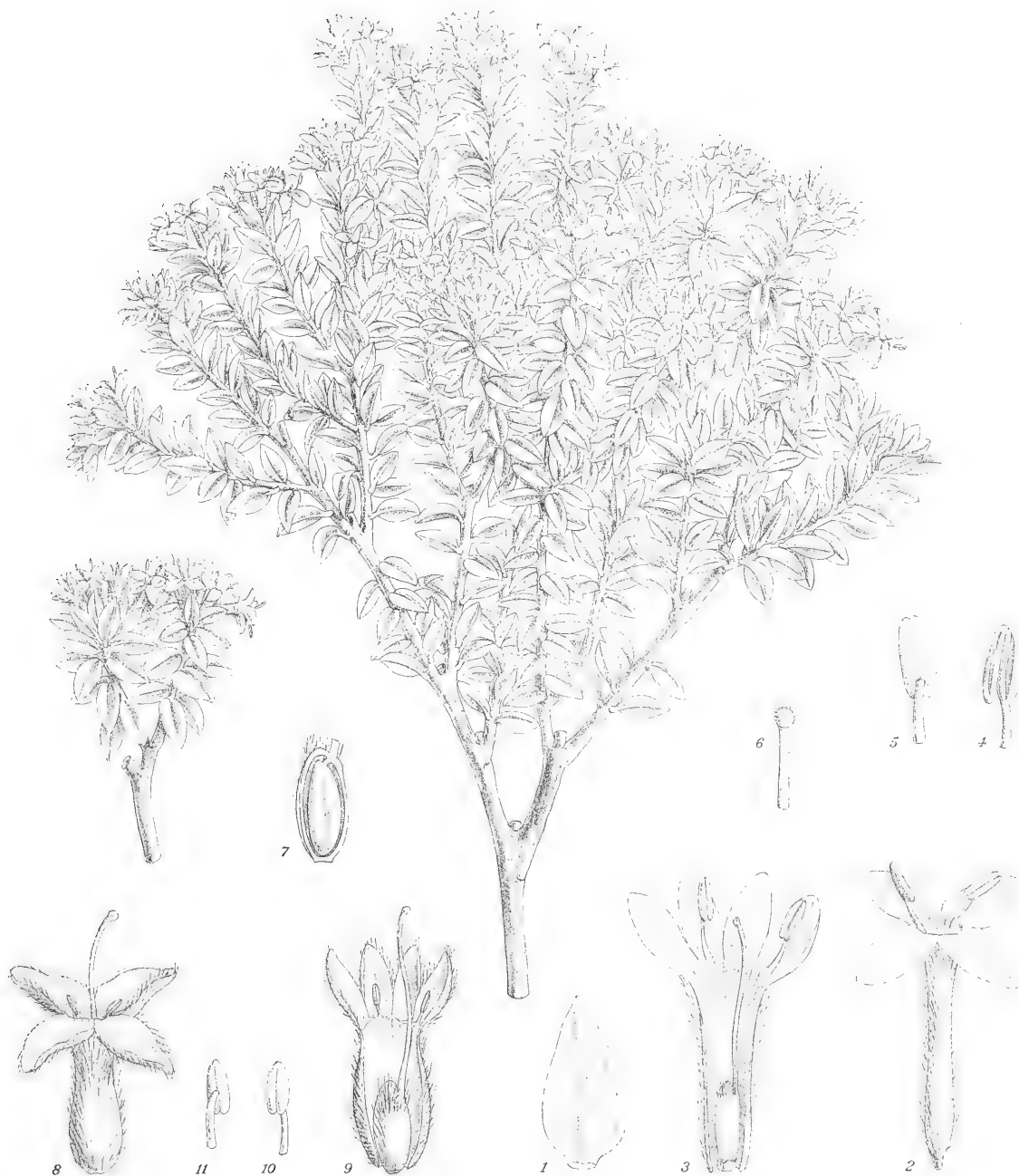
Pimelea longifolia, Banks & Sol. ex Wikstr. in Vet. Akad. Handl. Stockh. (1818) 280 ;
Cheesem. Man. N.Z. Fl. 609.

Of the twelve species of *Pimelea* found in New Zealand this is by far the handsomest and the most attractive, and it says little for the enterprise of colonial horticulturists that it is so rarely seen in cultivation. It was first gathered by Sir Joseph Banks and Dr. Solander at Tolaga Bay during Cook's first voyage, and was subsequently noticed by them at Mercury Bay and Admiralty Bay. Curiously enough, it does not seem to have been collected either by Forster in Cook's second voyage, or by D'Urville or Allan Cunningham ; in fact, it was not until Mr. Colenso commenced his botanical explorations that it was again met with. Subsequent research has proved that although it cannot be called a common plant it is nevertheless thinly spread over the greater part of the North Island to the south of the Bay of Islands, ranging from sea-level to quite 3,000 ft. It crosses Cook Strait, and occurs in several localities on the west coast of the South Island, from Collingwood to Westport and Charleston, which is the most southern locality at present known. Mr. Benthham refers a plant from Lord Howe Island to the same species, but I have had no opportunity of examining specimens from thence.

Pimelea longifolia usually forms an erect branching shrub 3 ft. to 5 ft. or 6 ft. high, and is easily distinguished from all the other species found in New Zealand by the glabrous habit, large leaves, and many-flowered heads of large white flowers. Its nearest ally is undoubtedly *P. Gnidia*, which differs mainly in the much smaller and frequently keeled leaves, and in the smaller flowers. The variety *pulchella* is almost exactly intermediate between the two species, and might with perfect fairness be referred to either.

The flowers of *P. longifolia* are polygamo-dicæcious, or possibly trimorphic, and should be carefully studied by any botanist who is fortunate enough to reside in a locality where the species is abundant. I have figured three forms in the accompanying plate, as follows : First (see fig. 1), what I take to be a hermaphrodite flower, in which the perianth is large and broad, and the stamens and style are about the same length, and well exerted beyond the flower. Secondly (fig. 4), a male flower, with a much narrower perianth, and with the stamens agreeing with the previous form in length, but with the style much shorter and entirely included within the perianth-tube. Third (fig. 5), a female flower, also with a narrower perianth than in fig. 1, but with the style conspicuously exerted, and furnished with a large papillose stigma. The stamens have short filaments placed at the top of the perianth-tube, and the small anthers are usually devoid of pollen. It would be interesting to know whether the pollen of the hermaphrodite and male flowers is equally efficacious in fertilization, and also whether perfect fruit is produced by the so-called hermaphrodite flowers, the stigma of which is certainly not so well developed as in the female flowers.

PLATE 172. *Pimelea longifolia*, drawn from specimens gathered in the vicinity of Auckland. Fig. 1, hermaphrodite flower ($\times 3$) ; 2 and 3, front and back view of anthers ($\times 6$) ; 4, male flower, with short style ($\times 3$) ; 5, female flower ($\times 3$) ; 6, longitudinal section of ovary ($\times 6$) ; 7, seed (enlarged).



M. Smith del.
J. N. Pritch lith.

West, Newman imp.

PIMELEA BUXIFOLIA, Hook f.

PLATE 173.—PIMELEA BUXIFOLIA.

FAMILY THYMELÆACEÆ.]

[GENUS PIMELEA, BANKS & SOL.

Pimelea buxifolia, Hook. f. *Handb. N.Z. Fl.* 243; *Cheesem. Man. N.Z. Fl.* 610.

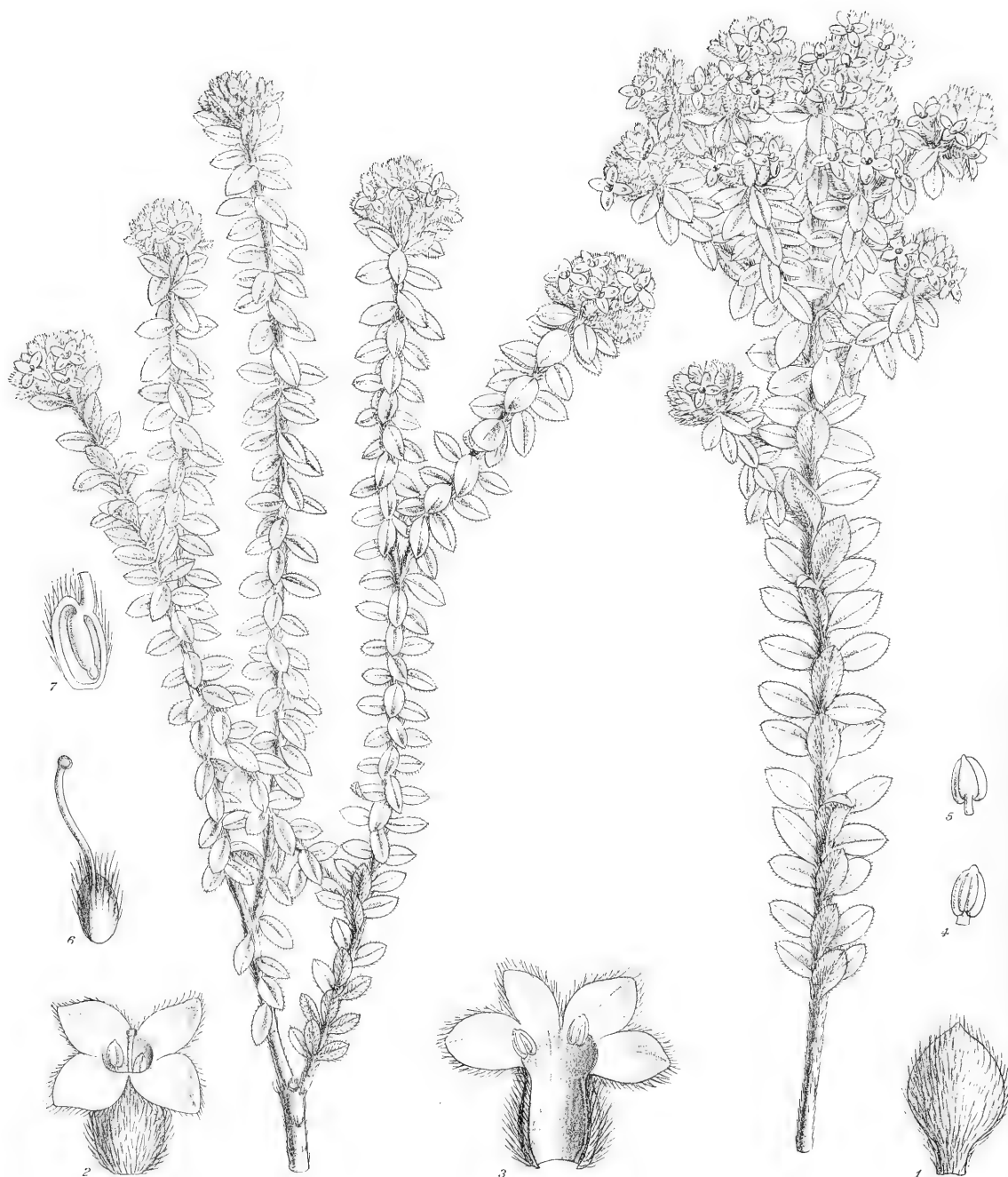
This handsome shrub was first collected by Dr. Dieffenbach, the naturalist to the New Zealand Company, during his travels in the North Island in the years 1839 to 1841. The exact locality is not known, but, judging from his itinerary, it must have been somewhere in the vicinity of Lake Taupo. In 1845 Mr. Colenso gathered it in his first attempt to cross the Ruahine Range, and again in 1847 near the base of Tongariro. Specimens from all these localities were in the hands of Sir J. D. Hooker when preparing his "*Flora Novæ Zelandiæ*," but were confounded with *P. Gnidia*. In the subsequently published "*Handbook*" he corrected the mistake, and described the species under the name it now bears.

Pimelea buxifolia has a somewhat limited range. Its northern limit, as far as is known at present, is on the mountains near the head of the Tairua River, Thames, where it was collected several years ago by the late Mr. J. Adams. It is plentiful on Hikurangi Mountain, in the East Cape district, and grows in great profusion on the central volcanic plateau surrounding Tongariro and Ruapehu. It is, in fact, one of the characteristic species of the subalpine scrub on the lower slopes of these mountains, at an altitude of 3,500 ft. to 5,500 ft. It occurs on the Kaimanawa and Ruahine Mountains, and also on Kaweka Mountain, in Hawke's Bay; but, curiously enough, has not yet been recorded from the Tararua Mountains.

As a species *P. buxifolia* is closely allied to *P. Gnidia*, but is easily distinguished by the branches being hirsute with coarse hairs, whereas they are glabrous in *P. Gnidia*. The floral leaves of *P. buxifolia* are usually more conspicuous than in *P. Gnidia*. The "evident" lateral nerves of the leaf, referred to by Hooker as a "good character," are sometimes decidedly conspicuous (see fig. 1 of the accompanying plate), but, unfortunately, the plant varies greatly in that respect, and the veins are frequently very obscure.

Pimelea buxifolia bears two forms of flowers. The first, which may be called the male, has a longer and narrower perianth; the stamens are decidedly exserted and have large anthers producing plenty of pollen; and the style, with its small stigma, is barely exserted beyond the perianth-tube. The second, which bears abundant fruit, has a shorter and broader perianth, conspicuously swollen at the base; the stamens are not exserted, and the anthers are small, producing either a small quantity of pollen or none at all; and the style, which bears a large papillose stigma, is conspicuously exserted. I have not seen hermaphrodite flowers similar to those figured in the previous plate of *P. longifolia*.

PLATE 173. *Pimelea buxifolia*, drawn from specimens collected near the base of Ngauruhoe; alt. 4,000 ft. Fig. 1. leaf ($\times 3$); 2. male flower, with long stamens and short style ($\times 4$); 3. perianth laid open ($\times 4$); 4 and 5. front and back view of anthers ($\times 8$); 6. stigma of female flower ($\times 8$); 7. longitudinal section of ovary of female flower ($\times 6$); 8. female flower, with long style and short stamens ($\times 4$); 9. perianth of same laid open ($\times 4$); 10 and 11. anthers from female flower, probably sterile ($\times 8$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

PIMELEA ARENARIA, A. Cunn.

PLATE 174.—PIMELEA ARENARIA.

FAMILY THYMELÆACEÆ.]

[GENUS PIMELEA, BANKS & SOL.

Pimelea arenaria, A. Cunn. in Bot. Mag. t. 3270; Hook. f. Handb. N.Z. Fl. 244; Cheesem. Man. N.Z. Fl. 612.

In some remarks respecting *Coprosma acerosa* (Plate 84 of this work) I have mentioned the fact that the sand-dunes so common on the coast-line of New Zealand support a very peculiar and characteristic vegetation, remarkably uniform throughout the whole length of the Dominion, and that, in addition to *Coprosma acerosa*, several other species are equally abundant at the North Cape and the Bluff. *Pimelea arenaria*, the subject of this plate, is one of these plants, being of general occurrence from the northern extreme to the shores of Foveaux Strait. It is not, however, such an abundant species as the *Coprosma*.

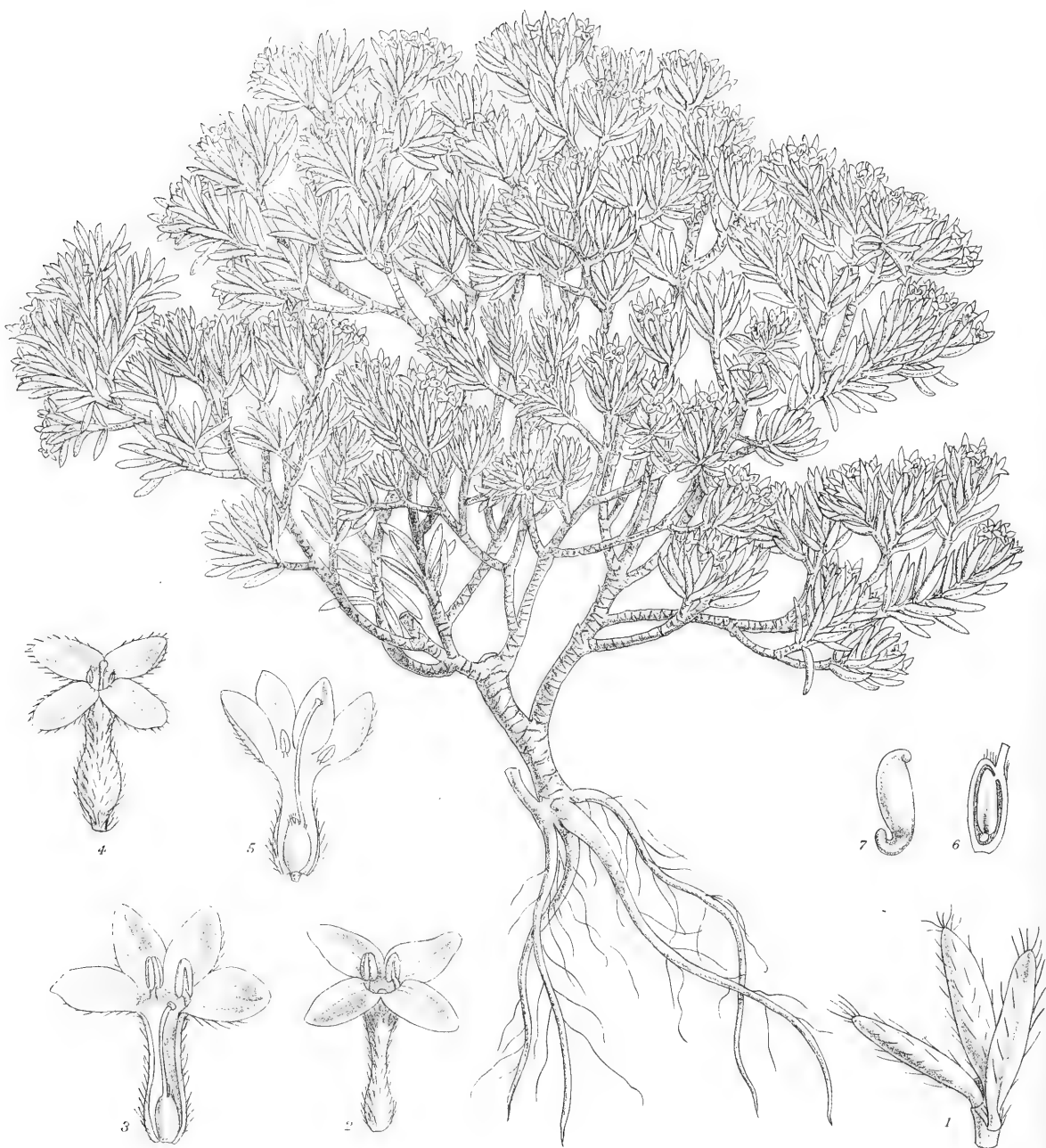
Pimelea arenaria was discovered during Cook's first visit in 1769, being collected by Banks and Solander at Tolaga Bay, and later on at Mercury Bay. It does not seem to have been observed by the Forsters during Cook's second visit, or by D'Urville during the voyage of the "Astrolabe"; but in 1826 it was collected by Allan Cunningham near the entrance to the Hokianga River, and a few years later by Richard Cunningham at Takou Bay, between the Bay of Islands and Whangaroa. Since then it has been observed by all botanists who have examined the coast-line of either the North or the South Island. It has also been gathered on the Chatham Islands by Dieffenbach and other explorers.

Pimelea arenaria is practically confined to sand-dunes or sandy coasts. Its main stems are usually prostrate, and covered to a varying depth with sand; but from them arise numerous erect or inclined simple or corymbosely divided branches, which are seldom much more than 2 ft. in height. A single plant may thus form a compact patch of some little size. Like most of the species of *Pimelea* the branches are tough, flexible, and cord-like. When partially buried with sand they will readily send out adventitious roots. As has been pointed out by Dr. Cockayne in his report on the sand-dunes of the Dominion, the plant is thus of considerable value as a "sand-collector," if not as a sand-binder, although it has not the importance of the introduced *Ammophila arundinacea* or the indigenous *Scirpus frondosus* and *Spinifex hirsutus*.

The silvery-white appressed hairs which clothe the young branches and the under-surface of the leaves give the plant a very attractive appearance, and it is somewhat curious that it is so seldom seen in gardens. The flowers are in compact heads at the tips of the branches, and are polygamo-diœcious, the females being easily recognized by being smaller and broader, and from having a longer style and a larger papillose stigma.

According to Mr. Colenso, the Maoris formerly used the inner bark of the branches for preparing cloth-like strips for fastening up their hair, a practice which has long since ceased. The white fleshy berries were also collected and used for food.

PLATE 174. *Pimelea arenaria*, drawn from specimens collected at the entrance to the Manukau Harbour. Fig. 1, back of leaf, showing the covering of silvery-white appressed hairs ($\times 3$); 2, female flower ($\times 4$); 3, perianth laid open ($\times 4$); 4 and 5, front and back view of anther ($\times 8$); 6, ovary, with style and stigma ($\times 6$); 7, longitudinal section of ovary ($\times 7$).



M. Smith del.
J. N. Pritch lith.

West, Newman imp.

PIMELEA SUTERI, T. Kirk.

PLATE 175.—PIMELEA SUTERI.

FAMILY THYMELÆACEÆ.]

[GENUS PIMELEA, BANKS & SOL.

Pimelea Suteri, *T. Kirk in Trans. N.Z. Inst.* xxvi (1894), 259; *Cheesem. Man. N.Z. Fl.* 613.

So far as I can ascertain, *Pimelea Suteri* was originally discovered by Sir David Monro on Dun Mountain, Nelson, about the year 1854. Specimens were communicated to Sir J. D. Hooker at Kew, and were considered by him to be an alpine state of *P. prostrata* (now known as *P. lavigata*). In the "Handbook" Hooker included it in his var. γ of *P. prostrata*, although, as Mr. Kirk correctly remarks, *P. Suteri* never has ovate or truly acute leaves, and the hairs are mostly confined to the margins and apices of the leaves. In 1868 specimens gathered on Dun Mountain by Mr. P. Lawson were communicated to Mr. T. Kirk, who appears to have also examined others collected by Mr. W. T. L. Travers and Mr. R. I. Kingsley. In 1881 I observed it in the same locality, and it has since been repeatedly gathered by Mr. F. G. Gibbs, who has kindly favoured me with the specimens from which the accompanying plate has been prepared.

As a species *P. Suteri* is allied to *P. lavigata* and *P. Lyallii*, but differs from both in its peculiar habit, and in the much narrower leaves, which have their margins and apices ciliate with long hairs. These hairs are also occasionally present on each side of the midrib on the back of the leaf, as shown in fig. 1 of the plate. I have not seen ripe fruit, but Mr. Kirk states that "it is quite unlike that of any other species." He describes it as "baccate, ovate-acuminate, hairy at the apex, opaque, red." The fruit of *P. lavigata* is white, and often almost translucent.

Up to the present time *P. Suteri* has not been found except on the Dun Mountain Range, where it is not uncommon at an altitude of from 2,500 ft. to 3,500 ft. It is worth remark that three other species—*Raoulia Gibbsii*, *Myosotis Monroi*, and *Veronica Gibbsii*—are apparently confined to the same mountain chain.

It should be stated that *Pimelea Suteri* is named in honour of the late Right Rev. Dr. Suter, Bishop of Nelson, who for many years paid considerable attention to the botany of the Nelson District.

PLATE 175. *Pimelea Suteri*, drawn from specimens collected by Mr. F. G. Gibbs on Dun Mountain, Nelson, at an altitude of 4,000 ft. Fig. 1, tip of branchlet, showing leaves ($\times 5$); 2, male flower, with included style ($\times 5$); 3, perianth of same laid open ($\times 6$); 4, female flower, with exserted style ($\times 5$); 5, perianth of same laid open ($\times 6$); 6, longitudinal section of ovary ($\times 8$); 7, ovule ($\times 10$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

ELYTRANTHE ADAMSII, Engler.

PLATE 176.—ELYTRANTHE ADAMSII.

FAMILY LORANTHACEÆ.]

[GENUS ELYTRANTHE, BLUME.

Elytranthe Adamsii, Engl. in Engl. and Prantl, *Pflanzenf. Nachr.* i, 126; *Cheesem. Man. N.Z. Fl.* 1149.

Loranthus Adamsii, *Cheesem. in Trans. N.Z. Inst.* xiii (1881), 296.

Elytranthe Adamsii appears to have been originally discovered by Mr. T. Kirk, for there are specimens of old date in his herbarium labelled as having been collected in the Hunua Ranges. Through a curious misconception, he referred it to the totally different *E. tetrapetalus*, which is at once distinguished by its smaller size and more compact habit, by the smaller leaves, and by the much smaller flowers which ultimately split to the base into 4 free petals, whereas in *E. Adamsii* the corolla only splits to the base on one side, the 4 short lobes then pointing almost in one direction. In 1880 it was gathered in some quantity by Mr. J. Adams in the Thames district. Under his guidance, I had an opportunity of examining the plant in this habitat, and of obtaining a good suite of flowering specimens. From these I prepared a description of the species under the name of *Loranthus Adamsii*. Since then the genus *Loranthus* has been more or less dismembered, and the plant is now placed by Engler and other systematists in the genus *Elytranthe*.

Elytranthe Adamsii is usually parasitic on *Myrsine Urvillei*, *Melicope ternata*, and several species of *Coprosma*. It forms a small glabrous bush seldom more than 2 ft. or 3 ft. in diameter. In habit and mode of growth it much resembles *E. Colensoi*, and the foliage of the two plants is almost precisely similar. *E. Colensoi*, however, is a much larger plant, with a considerably more developed inflorescence, and the flowers are larger, ultimately splitting to the base into 4 free petals. I have already pointed out its differences from *E. tetrapetalus*.

I am not aware of any other localities for *Elytranthe Adamsii* beyond those already quoted of the Hunua Ranges and the Thames, but there can be little doubt that it has a more extensive range. While on the subject of the *Loranthaceæ*, I would suggest that search should be made in the Hawke's Bay District for *Phrygilanthus tenuiflorus*, originally discovered by Mr. Colenso at the base of the Ruahine Range (see his "Visits to the Ruahine Range," p. 11); and at the Bay of Islands and Whangaroa for the allied *Phrygilanthus Raoultii*, found in the two localities by Allan Cunningham and Raoul. These two plants have not been seen since their original discovery, more than seventy years ago.

PLATE 176. *Elytranthe Adamsii*, drawn from specimens collected by Mr. J. Adams near the Hape Creek, Thames. Fig. 1, flower-bud just previous to expansion ($\times 1\frac{1}{2}$); 2 and 3, front and back view of anthers ($\times 4$).



M. Smith del.
W. N. Pritch lith.

FUSANUS CUNNINGHAMII, Benth & Hook. f.

West, Newman imp.

PLATE 177.—FUSANUS CUNNINGHAMII.

FAMILY SANTALACEÆ.]

[GENUS FUSANUS, R. BR.

Fusanus Cunninghamii, Benth. and Hook. f. ex T. Kirk, Forest Fl. t. 75, 76; Cheesem. Man. N.Z. Fl. 624.

Santalum Cunninghamii, Hook. f. Fl. Nov. Zel. i. 223.

The subject of this plate, for which I retain the specific name proposed by Sir J. D. Hooker, was originally discovered by Allan Cunningham in forests at Whangaroa and the Bay of Islands in 1826. Cunningham correctly referred it to the *Santalaceæ*, and, believing that it constituted an undescribed genus, proposed to call it *Mida*, which he took to be the Maori name for the plant. In this he made an unfortunate error, the correct name, as every student of the Maori language knows, being *maire*. He committed a further mistake in attaching too much importance to variations in the width of the leaf in various specimens collected by him. He considered that these variations represented distinct species, and hence described his genus *Mida* as comprising three species: *Mida salicifolia*, with narrow-lanceolate leaves (see the fruiting specimen figured on the accompanying plate); *Mida eucalyptoides*, with lanceolate leaves; and *Mida myrtifolia*, with oval or ovate-lanceolate leaves (see the flowering specimens figured). A very little observation would have shown him how untrustworthy these differences are, for all three forms of leaves can be found on the same plant. In 1843 Sir William Hooker figured two of the forms in the "Icones Plantarum" (tt. 563, 575), pointing out that they represented nothing more than slight varieties; and, as he considered that Cunningham's genus *Mida* was inseparable from *Santalum*, he proposed that the plant should in future bear the name of *Santalum Mida*. But Sir J. D. Hooker, in the "Flora Novæ Zelandiæ," pointed out that *Mida* was not the Maori name of the plant, and that to adopt it was only a further instance of the impropriety of using Native names for scientific purposes, a practice which had "introduced confusion into the botany of every country, and served no good purpose." He consequently suggested the new name of *Santalum Cunninghamii*, which at once received general recognition.

Of late years the genus *Santalum* has been more or less subdivided. In the "Genera Plantarum" our plant was placed in the Australian genus *Fusanus*, which differs from *Santalum* in the structure of the disc and in other characters. But it was also admitted that the New Zealand species was sufficiently distinct to form a subgenus, for which Cunningham's name of *Mida* was revived. It seems not improbable that some day it will be fully restored to generic rank. Whether that is the case or not, it is to be hoped that fresh confusion will not be caused by a needless change of the specific name.

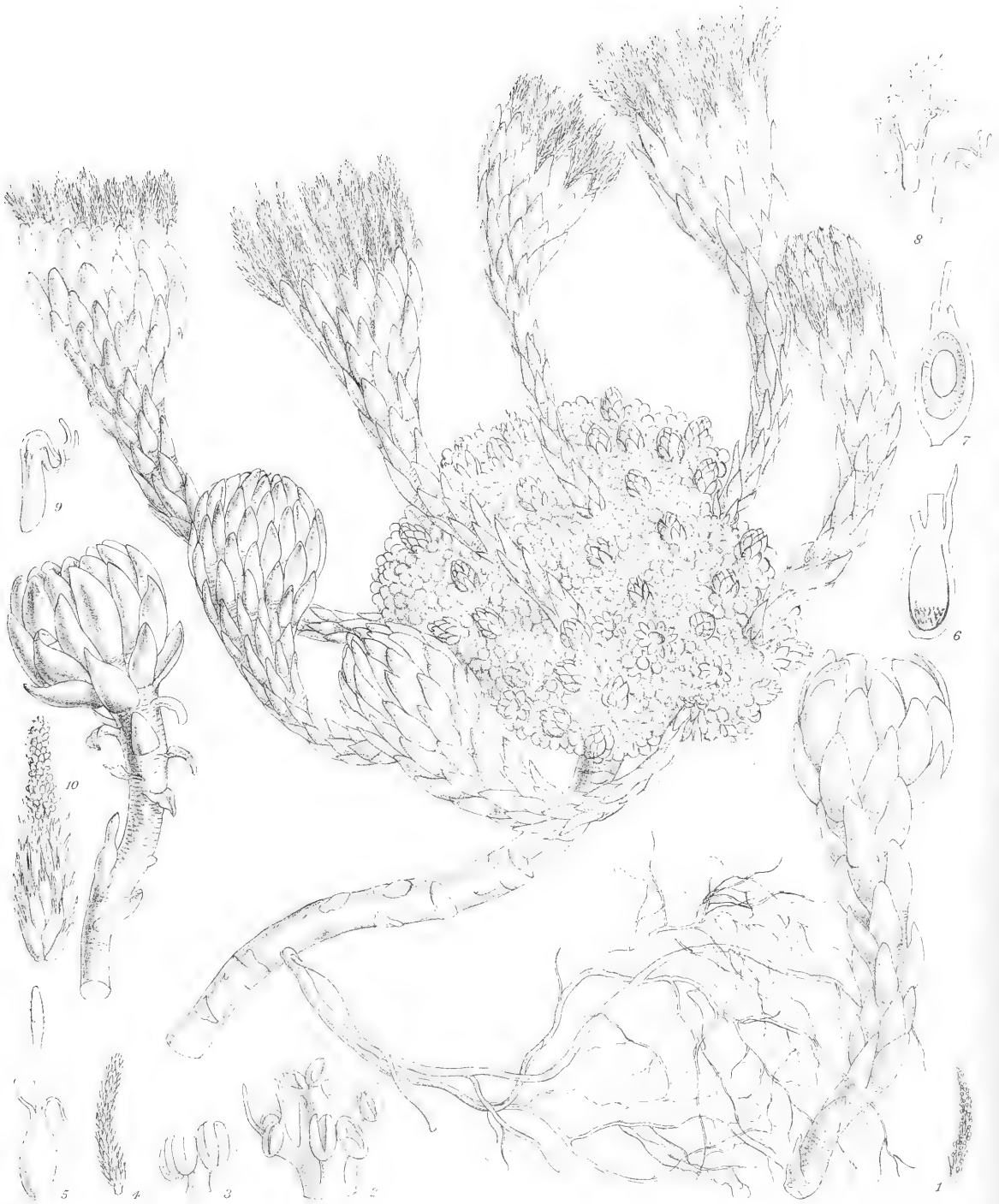
Fusanus Cunninghamii forms a small tree from 10 ft. to 25 ft. in height, with a trunk which seldom exceeds 9 in. in diameter. As already mentioned, it is remarkable for the great variation in the shape of the leaves, which vary from linear to oblong-ovate. Leaves of very different shapes can often be found on the same branch, but it is also common for the leaves to be fairly constant. Young plants show the greatest tendency to variation, and usually have narrower leaves than older individuals. Owing to the small size of the tree the wood is little used, but it is known to be hard and dense, and it might well be employed in ornamental turnery and inlaying.

Although *Fusanus* extends as far south as Cape Palliser, on the northern shore of Cook Strait, it is rare and local to the south of Rotorua and the East Cape. It

is most abundant north of Auckland, and is a common plant in kauri forests, and particularly among juvenile kauri. Its altitudinal range is from sea-level to 2,000 ft., but it is not abundant at an higher elevation than 1,500 ft.

As already stated, its Maori name is *maire*. Unfortunately, this name is also applied to three species of *Olea* and to *Eugenia Maire*, a circumstance which has led to some confusion; for, owing to the variability of the leaves of *Fusanus*, it is quite easy to mistake the foliage of the three genera. In some districts it is known by the name of New Zealand sandal-wood.

PLATE 177. *Fusanus Cunninghamii*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, flower and flower-bud ($\times 4$); 2, section of perianth, showing stamens and ovary ($\times 6$); 3, perianth-leaflet ($\times 7$); 4 and 5, front and back view of anther ($\times 12$); 6, longitudinal section of ovary ($\times 6$); 7, fruit ($\times 2$); 8, section of fruit ($\times 2$); 9, embryo ($\times 3$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

DACTYLANTHUS TAYLORII, Hook. f.

PLATE 178.—DACTYLANTHUS TAYLORI.

FAMILY BALANOPHORACEÆ.]

[GENUS DACTYLANTHUS, HOOK. F.

Dactylanthus Taylori, Hook. f. in *Trans. Linn. Soc.* xxii (1859), 425. t. 75; *Handb. N.Z. Fl.* 255; *Cheesem. Man. N.Z. Fl.* 626.

This very remarkable plant was first described by Sir J. D. Hooker from specimens communicated by the Rev. Richard Taylor; but until quite lately all that was known of its original discovery was the account given by Mr. Taylor in his well-known book "Te Ika-a-Maui" (second edition, p. 697), where he says that he "first met with it on a mountain-range near Hikurangi, returning from Taupo." Mr. James Grant, however, in some notes published in the "Proceedings of the New Zealand Institute" for 1910-11, p. 98, has quoted some extracts from Mr. Taylor's manuscript journal, now in the possession of Mr. H. S. G. Harper, which show that the plant was gathered in March, 1845, in the rough forest-clad country not far from the Mangawhero River, the chief tributary of the Wangaehu River, and a little above where the road for Pukehika branches off from that to Hikurangi. From this it is evident that Mr. Taylor was travelling on the old Maori track from Taupo to Wanganui via Wangaehu. At a later date a Mr. Williamson gathered specimens at a place called Putotara and gave them to Mr. Taylor, and apparently it was these that were forwarded to Sir J. D. Hooker and described by him.

So far as I can ascertain, no additional information was obtained until April, 1869, when Mr. T. Kirk gathered it near the head of the Karaka Creek, at the Thames goldfields. This locality has since been repeatedly examined by the late Mr. Adams and myself, and no further specimens obtained. A few years later it was found in great abundance between Port Charles and Cape Colville by Mr. H. Nairn, who very kindly supplied me with flowering specimens of both sexes. Since then it has been noticed in many stations between Hokianga and Cook Strait, as will be seen from the following list, which includes all the localities that have been brought under my notice:—

Wooded plateau between Hokianga and the Northern Wairoa, *Percy Bedlington!* forests near the source of the Hoteo River, Kaipara, *R. Glanville!* between Port Charles and Cape Colville, *H. Nairn!* head of the Karaka Creek, Thames, *T. Kirk*; vicinity of the East Cape and Hicks Bay, abundant, *H. Hill!* Tarawera and Nuhaka, *A. Hamilton*; Runanga and Opepe, near Taupo, *H. Hill!* *T. F. C.*; Hawkston and Patoka (Hawke's Bay), *F. Hutchinson!* Taranaki (exact locality uncertain), *W. H. Skinner*; Upper Wanganui, at Pipiriki, *E. Phillips Turner*; Upper Waitotara, *J. R. Annabell!* between the Upper Wangaehu and Taupo, *Rev. R. Taylor*, *H. C. Field*; Upper Rangitikei, *J. P. Marshall*, *E. Phillips Turner*; Kaitoke, near Wellington, *J. S. Tennant* and others! As to the altitudinal range of the plant, it descends almost to sea-level at Port Charles, and ascends to 3,500 ft. or nearly so in the Upper Rangitikei and Wangaehu districts.

The following notes, which may be regarded as an amplification of the description given in the Manual, are based on the personal examination of specimens, either collected by myself, or communicated to me by other botanists, and in particular by Mr. H. Hill, of Napier. The plant is parasitic on the roots of trees in all stages of its growth. In its northern habitats the host is usually *Schefflera digitata*, but *Panax arboreum*, *Coprosma grandifolia*, and *Myrsine Urvillei* are frequently attacked. Further south *Panax arboreum* and *Pittosporum eugenioides* are the two species most commonly affected; but *Fagus*, *Hedycarya*, and *Geniostoma* have all been recorded. Careful observation will no doubt largely increase this list.

The rhizome of *Dactylanthus* is a rounded or amorphous tuberous-like mass rough all over with wart-like tubercles. It varies greatly in size and shape, but is always organically connected with a creeping root of the host, which it appears to surround and terminate, no doubt through the early death of the root beyond the point of attachment of the parasite. I have seen rhizomes nearly 18 in. in diameter, but the average size is not much more than that of the fist. Its development from the germinating-seed is unknown, the smallest specimens I have seen being from $\frac{1}{5}$ in. to $\frac{1}{4}$ in. in diameter, or about the size of small peas. But as these small specimens clearly show that the rootlet of the host is itself swollen and enlarged at the point of junction with the parasite, it seems most probable that the early development is in its main features similar to that of several other genera of *Balanophoraceæ*, as *Langsdorffia*, *Scybalium*, and *Balanophora*. The rhizome is usually buried beneath the humus of the forest-floor; but on the sides of steep declivities, where the soil has presumably been washed away, they may be seen quite exposed. In a little gully at Opepe, near Taupo, I once saw eight or nine in the space of a few yards.

Every year numerous flowering-stems are produced from the rhizome. These are from 2 in. to 6 in. in height, fleshy when young, clothed with brown imbricating scales, the lower of which are shorter and more laxly placed, the upper longer and much more closely packed. The stems are thus clavate in shape, being often an inch in diameter at the top, although very much less below. The uppermost scales form a kind of involucre for the spadices, which in the young state they entirely conceal. The spadices vary in number from 10 to 30 or even more, and are usually from $\frac{3}{4}$ in. to $1\frac{1}{2}$ in. in length. The flowers are very numerous on the spadices, densely packed above, rather more open below.

Generally speaking, the flowers are dioecious, the male spadices being produced on one plant and the females on another. I have, however, seen several specimens in which the upper flowers are all male, and the lower flowers all female, one of these examples being shown on the accompanying plate (fig. 10). And it is quite common for the male spadices to have numerous abortive female flowers at the base (figs. 8, 9). The fruit is minute and crustaceous, and is tightly invested by the withered remains of the perianth. Both Mr. Hemsley and myself have failed to find an embryo, but possibly it is not fully differentiated from the albumen of the seed until germination commences.

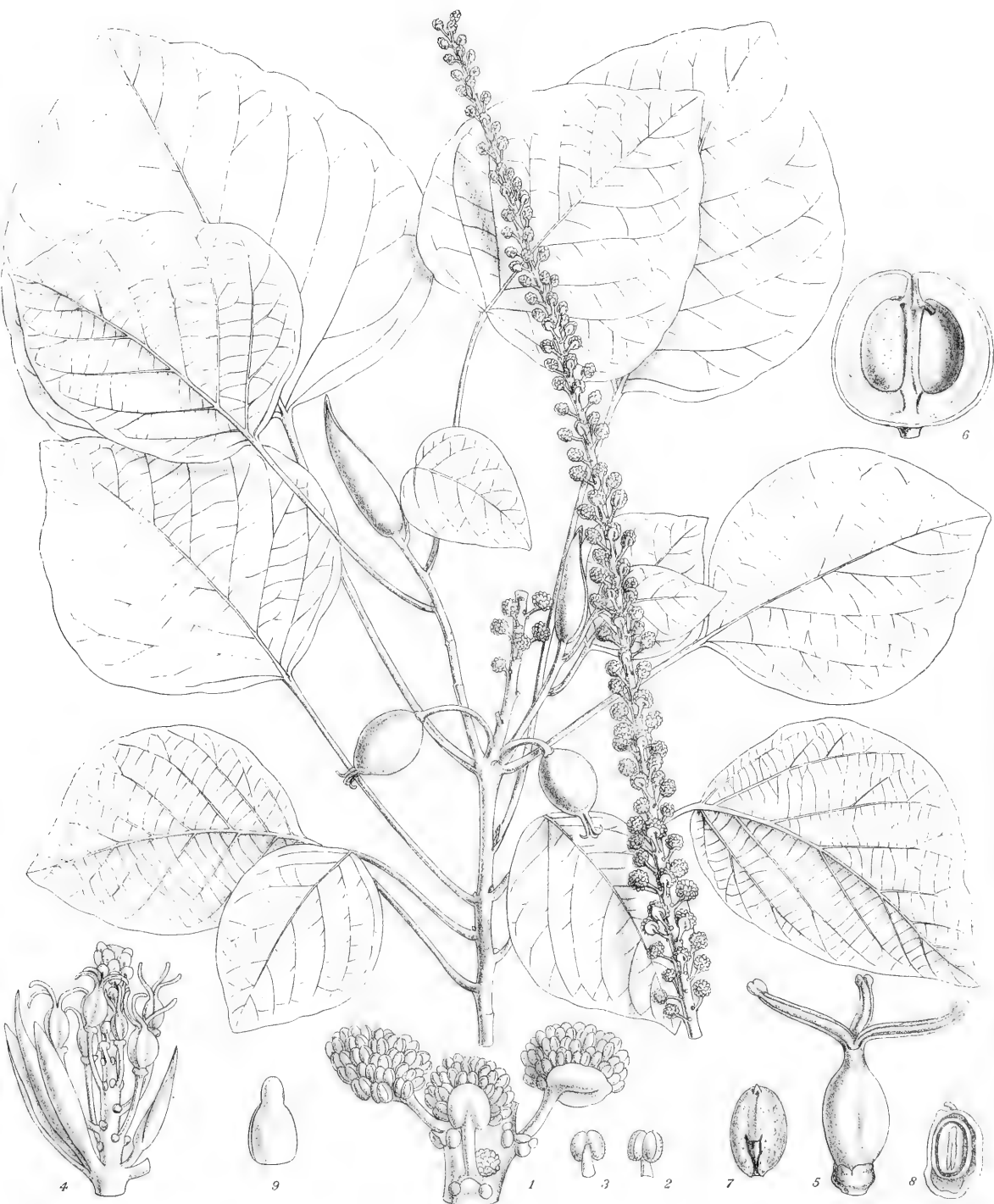
Dactylanthus is a very isolated genus. It is remarkable for the reduction of the male flowers to a solitary stamen without any trace of perianth, and the female flowers consist only of a 1-celled and 1-ovuled ovary closely invested by a perianth which is produced upwards into 2 or 3 subulate processes. The female flowers resemble those of the Mediterranean *Cynomorium*; the males are compared by Sir J. D. Hooker to the African genus *Thonningia*.

The *Balanophoraceæ* have an almost purely tropical distribution. *Dactylanthus* is the most southern representative, but the South African *Sarcophyte* and *Mystropetalum* almost reach a similar latitude. In the Northern Hemisphere *Cynomorium*, which extends as far as the south of Spain and Italy, is the only genus which crosses the northern tropic. All the rest of the family, comprising ten genera and about thirty-five species, are confined to the warm and humid forests of the Tropical Zone.

According to the Rev. R. Taylor, the Maori name of *Dactylanthus* is pua-o-te-reinga, or "the flower of Hades." I have been unable to find any legend or tradition explaining the origin of such a name. Mr. H. Hill states that in the East Cape district the Maoris apply the name of wae-wae-atua to the plant. This he interprets as meaning "the fingers, the foot, or the toes of the atua" (or spirit). With these two exceptions I have been unable to find any mention of *Dactylanthus* in Maori literature. Nor is this at all strange, seeing that it is seldom found save in forest districts far from human habitation, and that it is not at all noticeable save in the short flowering-period.

It should be mentioned that the flowers are strongly fragrant. Mr. Hill states that he has frequently been able to discover the plant through "the delicious daphne-like fragrance which it emitted." The Rev. R. Taylor says that the flowers have a "strong smell, partly fragrant, although earthy and unpleasant." Further on he quotes a statement of Mr. Williamson's to the effect that the odour was "something like that of a ripe melon." My own experience is that the fragrance is decidedly pleasant when the flowers first expand, but becomes heavy and disagreeable when they commence to decay.

PLATE 178. *Dactyланthus Taylora*, drawn from specimens collected by Mr. H. Hill and myself at Opepe, near Taupo; and by Mr. F. Hutchinson at Hawkston, near Napier. Fig. 1, male spadix (natural size); 2, portion of same ($\times 3$); 3, male flower ($\times 6$); 4, female spadix (natural size); 5, female flower ($\times 4$); 6, longitudinal section of fruit, showing seed ($\times 5$); 7, section of seed ($\times 5$); 8, base of male spadix, with abortive female flowers ($\times 3$); 9, abortive female flowers ($\times 4$); 10, spadix, with both male and female flowers ($\times 4$).



M. Smith del.
J. N. Fitch lith.

West, Newman. imp.

HOMALANTHUS POLYANDRUS, *Cheesem.*

PLATE 179.—HOMALANTHUS POLYANDRUS.

FAMILY EUPHORBIACEÆ.]

[GENUS HOMALANTHUS, A. JUSS.

Homalanthus polyandrus, *Cheesem. Man. N.Z. Fl.* 630.
Carumbium polyandrum, *Hook. f. Handb. N.Z. Fl.* 248.

This graceful and attractive tree was discovered in July, 1854, during a visit made by Captain H. M. Denham, of H.M.S. "Herald," to Sunday, or Raoul Island, the chief island of the Kermadec Group. The "Herald" arrived on the 2nd July, and remained until the 24th of the same month. During this brief stay a survey was made of the island; and Messrs. J. Milne and W. McGillivray, the naturalists attached to the "Herald," made a small collection of plants. This was placed in the hands of Sir J. D. Hooker, and formed the foundation of a paper on "The Botany of Raoul Island" printed in the "Journal of the Linnean Society" (vol. i, p. 125). Forty-two species were recorded as inhabiting the island, and in the list occurs the name of "*Omalaanthus nutans*," Guill., a species originally discovered in New Caledonia. In the "Handbook" Sir J. D. Hooker recognized that the Kermadec plant differed from the New Caledonian, and described it under the name of *Carumbium polyandrum*. As the genus *Carumbium* is now merged with *Homalanthus* our plant must take the name of *H. polyandrus*.

In a visit paid to the Kermadec Islands in August, 1887, I had an opportunity of examining the flora of the group, and of collecting specimens of most of the species. At that time *H. polyandrus* was not uncommon in sheltered places on Sunday Island, and I also saw a few plants in the crater-basin of Macaulay Island. But Mr. W. R. B. Oliver, who visited Sunday Island in 1907-8, remaining thereon for eleven months, states (*Trans. N.Z. Inst.* xlii (1910), 167) that it is now confined to a few localities inaccessible to goats. According to him, "these animals absolutely determine the existence of the species. They eat the bark from the trunk as high as they can reach, and the tree dies in consequence." With the knowledge that we possess respecting the destruction of the indigenous flora on St. Helena through the agency of goats, it is to be feared that *Homalanthus polyandrus* is in danger of being blotted out of existence in its only known habitat. Fortunately, it has found its way into Auckland gardens.

Homalanthus polyandrus is a graceful tree 10 ft. to 25 ft. high. Young plants form slender unbranched rod-like stems 6 ft. to 15 ft. high, with large leaves sometimes more than a foot in diameter. Older plants branch freely and have much smaller foliage from 2 in. to 4 in. long. The leaves are quite glabrous, very thin and delicate, glaucous beneath, and with reddish margins. In cultivation in Auckland the leaves often turn dark reddish-brown or sometimes nearly scarlet in winter, and then present a very ornamental appearance. The flowers are arranged in slender erect racemes 4 in. to 9 in. long, the females being few in number at the base of the racemes, the males very numerous and occupying by far the greater part of the raceme. All parts of the plant exude a milky latex when broken or bruised.

The genus *Homalanthus* is essentially Polynesian and Malayan. In addition to the New Zealand plant, there are from eight to fifteen others, according to the different views of authors, ranging from Tahiti to eastern Australia, and stretching northwards as far as the Philippine Islands. Several of the species are very closely allied, and it is quite possible that their number will be reduced by future systematists.

PLATE 179. *Homalanthus polyandrus*, drawn from specimens collected on the Kermadec Islands. Fig. 1, portion of male inflorescence ($\times 4$); 2 and 3, front and back view of anther ($\times 5$); 4, female inflorescence ($\times 2$); 5, pistil ($\times 5$); 6, longitudinal section of fruit ($\times 3$); 7, seed ($\times 3$); 8, longitudinal section of same ($\times 3$); 9, half of embryo ($\times 6$).



M. Smith del.
J.N. Fitch lith.

West Newman imp.

PARATROPHIS HETEROPHYLLA, Blume.

PLATE 180.—PARATROPHIS HETEROPHYLLA.

FAMILY URTICACEÆ.]

[GENUS PARATROPHIS, BLUME.

Paratrophis heterophylla, Blume, *Mus. Bot. Lugd. Bot.* ii, 81; *Cheesem. Man. N.Z. Fl.* 632.
Epicarpurus microphyllus, Raoul, *Choix*, 14, t. 9.

The genus *Paratrophis*, as defined in Hooker and Bentham's "Genera Plantarum" and Engler and Prantl's "Pflanzenfamilien," now contains nine species. Three of these are from New Zealand, one from Tahiti, one from the Fiji Islands, three have been recently described from Samoa, and there is an outlying species in the Philippine Islands. The genus is therefore one of those which prove an affinity between the vegetation of New Zealand, Polynesia, and Malaya, an affinity which is better developed than is usually supposed. The names of the following genera, among others, will occur to those who are aware of this relationship: *Melicope*, *Dysoxylum*, *Melicope*, *Corynocarpus*, *Meryta*, *Schefflera*, *Coprosma*, *Ascarina*, *Hedyocarya*, *Homalanthus*, *Paratrophis*, *Agathis*, and *Earina*.

There can be little doubt that *Paratrophis heterophylla* was observed by some of the early voyagers, although we have no positive proof that such was the case. The closely allied *P. Banksii*, which is a comparatively rare and local plant, was collected and figured by Banks and Solander; but our first certain knowledge of *P. heterophylla* was supplied by the French botanist Raoul, who gathered it at Akaroa in either 1840 or 1841. He published a description in 1844 under the name of *Epicarpurus microphyllus*, and a beautiful plate of it also appeared in his "Choix de Plantes de la Nouvelle Zélande," published in 1846. In this latter work he alludes to the receipt of numerous specimens from Sir J. D. Hooker which he believed to belong to the same species, but which differed in the much larger foliage. He therefore suggested that the name of *microphyllus* should be changed to that of *heterophyllus*. A few years later the well-known botanist Blume pointed out that Raoul's plant in no way belonged to *Epicarpurus*, which was a synonym of *Streblus*. He therefore proposed the new generic name of *Paratrophis*, and at the same time accepted Raoul's suggestion to change the specific name to *heterophyllus*. In some respects the alteration is to be regretted, for there can be no doubt that Hooker's specimens belonged to *P. Banksii*, and it is doubtful whether the name will be adopted by those who consider that the earliest specific name must in all cases be retained.

P. heterophyllus has a wide range in the Dominion, being found from Mongonui and Kaitaia in the north to Foveaux Strait in the south. It occurs on the Great and Little Barrier Islands, but has not been recorded either from Stewart Island or the Chatham Islands. It is most abundant in moist lowland forests, or by the side of rivers, &c., and is seldom seen much above an elevation of 1,500 ft. It usually forms a tree of from 15 ft. to 40 ft. in height, with a trunk varying from 9 in. to 24 in. in diameter, the bark being grey or almost white, and rough with raised lenticels. Like many other New Zealand trees, it has a juvenile state widely differing in habit and foliage from that of the adult. The young plant has numerous long and slender flexuous and often interlaced branches, with dark-brown bark. The leaves are distant, and vary greatly in shape, from oblong or obovate to almost orbicular, and are frequently irregularly lobed or almost pinnatifid, as shown in fig. C of the accompanying plate. In the adult the branches are shorter and stiffer, with numerous branchlets; and the leaves become more uniform in size and shape, with crenate-dentate margins.

A sweetish milky juice is exuded in considerable quantity when the bark is wounded. In the early days of colonization it was frequently used with tea instead of milk, and from that the plant received the local names of milk-tree, or cow-tree. The Maori name is turepo.

PLATE 180. *Paratrophis heterophylla*, drawn from specimens (male, female, and branch from a young tree) collected near Mercer, by the Waikato River. Fig. 1, leaf ($\times 2$); 2, male flower-bud ($\times 6$); 3, peltate scale ($\times 8$); 4, male flower ($\times 6$); 5, male flower from above ($\times 6$); 6, stamen ($\times 8$); 7, branchlet, with female flowers ($\times 5$); 8, section of ovary ($\times 7$); 9, longitudinal section of fruit ($\times 2\frac{1}{2}$); 10, section of seed ($\times 3$); 11, embryo (enlarged).



H. Smith del
J.N. Fitch lith.

BOEHMERIA DEALBATA, *Cheesem.*

West, Newman imp.

PLATE 181.—BÆHMERIA DEALBATA.

FAMILY URTICACEÆ.]

[GENUS BÆHMERIA, JACQ.]

Bæhmeria dealbata, Cheesem. in *Trans. N.Z. Inst.* xxiv (1892), 410; *Cheesem. Man. N.Z. Fl.* 637.

Our knowledge of this fine species of *Bæhmeria* dates from August, 1887, when I collected it on Sunday Island, the chief island of the Kermadec Group, during a visit of the Colonial Government steamer "Stella," made for the purpose of formally annexing the group to the Colony of New Zealand. At that time I was inclined to place it as a variety of the Norfolk Island *B. australis*, a species with which I was only acquainted through the descriptions of Endlicher and Weddell, and I accordingly referred it to that plant in my account of the flora of the Kermadec Islands published in the "Transactions of the New Zealand Institute" (vol. xx, p. 173). Later on, however, Mr. Hemsley did me the favour of comparing it with authentic specimens of *B. australis*, and ascertained that it differed from that species in having the leaves more shortly petiolate, 3-nerved and otherwise strongly nerved, and with the upper surface distinctly rugulose. It appears to be intermediate in its characters between the Norfolk Island *B. australis* and the Lord Howe Island *B. calophleba*.

The genus *Bæhmeria*, which attains its southern limit in the Kermadec Islands, is found in almost all tropical and subtropical countries, the number of species known being about fifty. At the time of my visit *B. dealbata* was not uncommon in woods in the lower portions of Sunday Island, and it has since been noticed by all visitors interested in the plants of the island. Mr. W. R. B. Oliver, who has recently made a careful botanical exploration of the whole group, also observed it on the rocky sides of some ravines in Macaulay Island.

I have had *B. dealbata* in cultivation in my garden at Remuera since 1888. Although the flowers are small and inconspicuous, and offer no attraction to the horticulturist, the plant is not without some value in the shrubbery. Its growth is rapid, it stands exposure well, and it has a neat and compact mode of growth. In addition, the leaves are decidedly handsome from their conspicuous ribbing, and from the contrast between the hoary white of the under surface and the green and glabrous upper surface.

PLATE 181. *Bæhmeria dealbata*, drawn from specimens cultivated in Auckland. Fig. 1, male flower ($\times 8$); 2, the same with the perianth laid open ($\times 8$); 3 and 4, front and back view of stamens ($\times 8$); 5, female flower ($\times 8$); 6, the same laid open ($\times 8$); 7, enlarged perianth enclosing the ripe fruit ($\times 6$); 8, fruit removed from the perianth ($\times 8$); 9, embryo (enlarged).



M. Smith del.
J. W. Fitch lith.

West, Newman imp.

FAGUS APICULATA, Col.

PLATE 182.—FAGUS APICULATA.

FAMILY CUPULIFERÆ.]

[GENUS FAGUS, LINN.

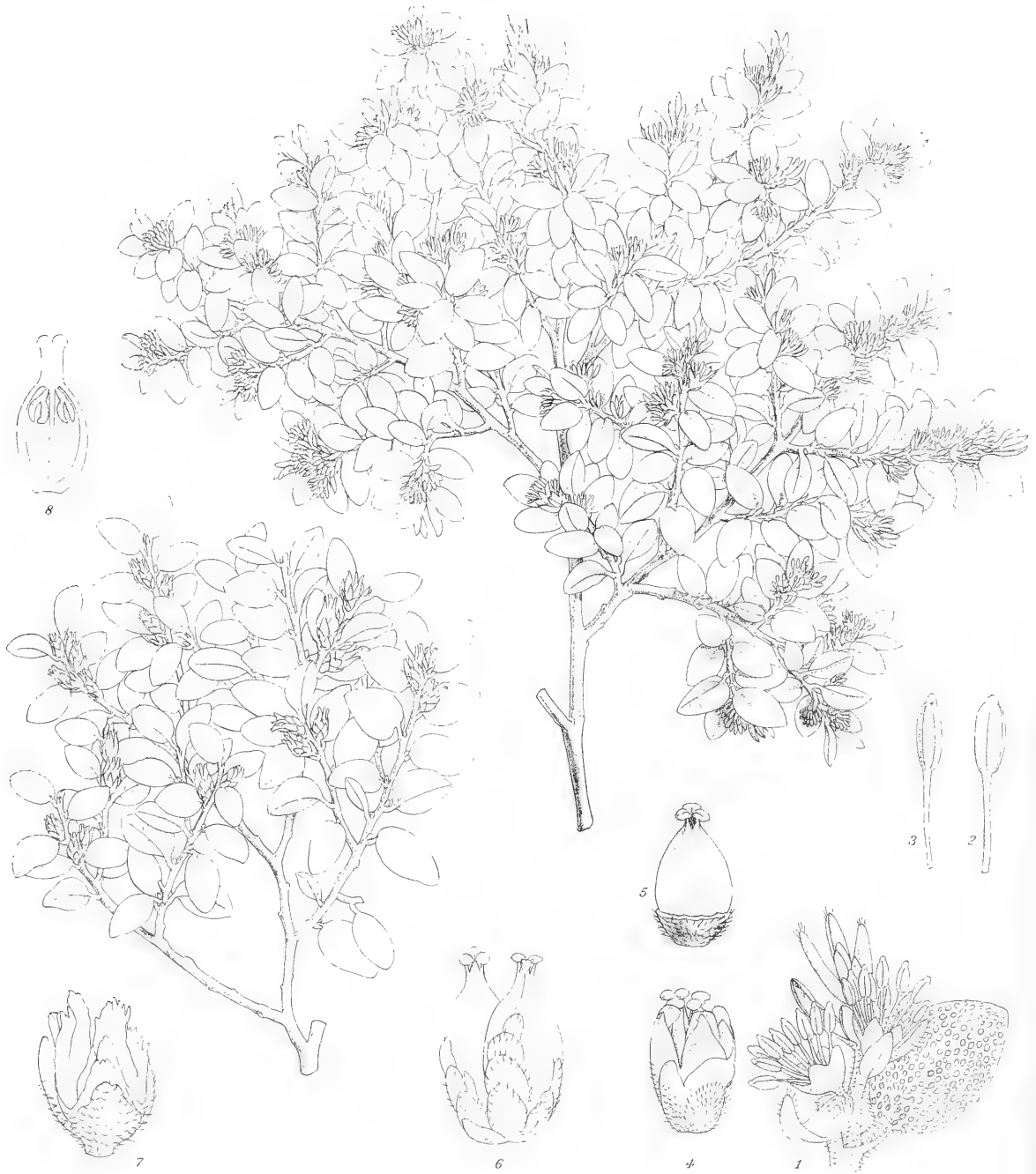
Fagus apiculata, Col. in *Trans. N.Z. Inst.* xvi (1884), 335; *Cheesem. Man. N.Z. Fl.* 642.

Fagus apiculata was first discovered by the veteran botanist Mr. Colenso in 1883, in dense forests between Matamau and Dannevirke, Hawke's Bay; and was described by him in the "Transactions of the New Zealand Institute" for the same year (vol. xvi, p. 335). In subsequent years he frequently visited the same locality, and obtained a considerable number of flowering and fruiting specimens. Some of these were communicated to Mr. T. Kirk, and formed the material from which the plate given in the "Forest Flora" was prepared; others were kindly forwarded to me, and have been used in drawing the accompanying illustration. The range of the species is imperfectly known. The typical state—*i.e.*, that discovered by Colenso and figured herewith—is only known for certain in the locality mentioned by him; but closely allied plants have been collected in several localities near Wellington, and along the flanks of the Tararua Range. A similar plant, of which I have seen no specimens, has also been recorded by Dr. Cockayne from Mount Fyfe, Marlborough.

In the "Forest Flora" Mr. Kirk restricts *F. apiculata* to Colenso's type, which has thin apiculate almost glabrous leaves, which are nearly entire. The Wellington plants mentioned above, which have more coriaceous leaves pubescent beneath and with the margins obscurely toothed, were referred by him to *F. fusca* as varieties *dubia* and *obsoleta*. But they have the small leaves and narrow involucre of *F. apiculata*, and are much more appropriately placed under it. Mr. Colenso, in his original notice of the plant, quite correctly stated that it constitutes a link between the species with large serrated leaves (*F. Menziesii* and *F. fusca*) and those with small entire leaves (*F. Solandri* and *F. cliffortioides*). Since then another species with intermediate leaves has been described (*F. Blairii*, T. Kirk). But it differs from all the forms of *F. apiculata* in the more coriaceous leaves clothed with fulvous tomentum beneath.

F. apiculata forms a tall handsome tree 40 ft. high or more, with a trunk 2 ft. in diameter. The branches spread in a horizontal plane, and according to Mr. Colenso are rather thinly covered with leaves. He also states that the bark of the trunk is pale and smooth, of the branches dark brown with lighter-coloured spots. He gives the length of the leaves as "1 in.," but most of the specimens forwarded to me have leaves rather under that size. Nothing is known of the value of the timber, but probably its quality will be very similar to that of *F. fusca*.

PLATE 182. *Fagus apiculata*, drawn from specimens collected by Mr. Colenso in forests near Norsewood, Hawke's Bay. Fig. 1, branchlet, with male and female flowers ($\times 3$); 2 and 3, front and back view of anthers ($\times 6$); 4, bract ($\times 3$); 5, female flowers and involucre ($\times 4$); 6, a single female flower removed from the involucre ($\times 6$); 7, longitudinal section of same ($\times 6$); 8, several fruits enclosed within the involucre ($\times 3$); 9, a single fruit ($\times 5$); 10, seed ($\times 5$).



M. Smith del.
J.N. Pritch lith.

West, Newman imp.

FAGUS CLIFFORTIODES, Hook. f.

PLATE 183.—FAGUS CLIFFORTIOIDES.

FAMILY CUPULIFERÆ.]

[GENUS FAGUS, LINN.]

Fagus cliffortioides, Hook. f. in Hook. Ic. Plant. t. 673 and t. 816b; Cheesem. Man. N.Z. Fl. 643.

So far as I can ascertain, this well-known tree was first gathered in Dusky Sound in the year 1791 by Mr. A. Menzies, the surgeon to Vancouver's expedition. His specimens, however, remained unnoticed for more than fifty years, for it was not until 1844 that Sir J. D. Hooker figured and described the species in the "Icones Plantarum." Almost immediately afterwards it was collected on the Nelson mountains by Mr. Bidwill, and on the Ruahine Range by Mr. Colenso. And, as soon as the vegetation of the mountainous interior of both the North and South Islands was examined, it was found that our plant was a dominant and widely distributed species, ranging from the East Cape to Foveaux Strait.

F. cliffortioides, for which Kirk's suggested name of "mountain-beech" should be adopted, forms a small tree from 15 ft. or 20 ft. to 50 ft. in height. Its size, however, is purely a matter of altitude, exposure, and soil. Near the upward limit of its growth it may be reduced to a densely branched bush a few feet in height, while in favourable situations, at a comparatively moderate elevation—say, from 2,000 ft. to 3,000 ft.—it sometimes reaches an extreme height of 60 ft., with a trunk over 2 ft. in diameter. The bark of the old trees is dark brown, but in young plants it is usually pale-coloured. The branches spread in a more or less horizontal plane, and are often arranged tier above tier, and the branchlets have their minor divisions and the leaves inserted in a distichous manner. The leaves are the smallest in the genus, the average size being from $\frac{1}{8}$ in. to $\frac{1}{2}$ in.; but I have seen specimens barely more than $\frac{1}{8}$ in., and sometimes they are as much as $\frac{3}{8}$ in. In outline they vary from ovate-oblong to ovate or ovate-orbicular, thus differing from those of *F. Solandri*, in which they are always oblong. The leaves are also more pointed at the apex and more rounded at the base than in *F. Solandri*. The upper surface is glabrous, but the under surface is more or less clothed with greyish-white hairs. The flowers are produced in great profusion, but the males greatly outnumber the females, and from their red colour often tinge the whole tree. The wood is not considered to be durable, but is often used for fence-posts, &c., in districts where it is the chief tree.

In the mountain districts of the South Island, especially on the eastern flanks of the Southern Alps, and on the central mountains of the North Island, *Fagus cliffortioides* often constitutes the greater portion of the mountain-forests, and in some localities is almost the only tree. In such situations it imparts a peculiar physiognomy to the forest. The general appearance is dark, sombre, and gloomy, particularly when looked at from a little distance, when it appears to cover mountain-slope and valley alike with one uniform sheet of dark dull green. But, as Mr. Kirk remarks ("Forest Flora," p. 201), when isolated trees of symmetrical shape are scattered over the landscape, giving a park-like character to the scenery, the general effect is decidedly pleasing. Within the forest there is often but little undergrowth, and that mainly composed of young plants of the *Fagus*. In fact, the open nature of the forest, and the comparative ease with which it can be penetrated in all directions, is one of the characteristic features of a forest of *F. cliffortioides*.

PLATE 183. *Fagus cliffortioides*, drawn from specimens collected on Ruapehu, and on Mount Arthur, Nelson. Fig. 1, male inflorescence ($\times 3$); 2 and 3, front and back view of stamens ($\times 6$); 4, female inflorescence ($\times 3$); 5, ovary ($\times 3$); 6, fruit ($\times 5$); 7, involucre ($\times 5$); 8, section of fruit ($\times 5$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

AGATHIS AUSTRALIS, *Salisb.*

PLATE 184.—AGATHIS AUSTRALIS.

(THE KAURI.)

FAMILY CONIFERÆ.]

[GENUS AGATHIS, SALISB.

Agathis australis, *Steud. Nom.* ed. ii, i, 34; *Cheesem. Man. N.Z. Fl.* 645.

Dammara australis, *Lamb. Pin.* ed. i, ii, 14.

Although Cunningham and others have stated that the kauri was discovered during Cook's first voyage, it is quite certain that it is not mentioned in Solander's manuscript flora, and that no specimens are contained in the Banksian collections. It is somewhat remarkable that such should be the case, for from Cook's anchorage in Mercury Bay (Opuragi, as he called it) forests of kauri could easily be discerned; and when, a little later in the voyage, his ship anchored off Tararu Point, at the entrance to the Thames River, and Cook, accompanied by Banks and Solander, made a boat voyage up the river to examine the immense forests of kahikatea that then clothed its banks, they must have passed within full view of the many groves of kauri which until 1868 occupied the spurs and ridges between the Kuranui and Karaka Creeks, immediately behind the present site of the Town of Thames. In both these localities they must have seen the tree in the not very remote distance. But probably Cook did not feel sufficiently sure of the behaviour of the Maoris to allow his people to wander far from the shore. In his second and third voyages he did not visit any locality within the geographical range of the kauri.

The actual discovery of the kauri was due to the French expedition of Marion du Fresne, and indirectly led to the death of Marion himself. His two ships, the "Marquis de Castries" and the "Mascarin," entered the Bay of Islands in May, 1772, or not much more than two years after Cook, and anchored near Motuarohia Island, directly in front of Manawara Bay. Marion's chief reason for visiting the Bay of Islands was to obtain some spars for the "Castries," which had lost her mizzenmast and bowsprit in a collision with the other vessel. While exploring for suitable timber Marion discovered a kind of "cedar" with the leaves of an olive (*un cèdre à feuilles d'olivier*). Quoting from Ling Roth's translation of the Abbé Rochon's account of the voyage (p. 73), "I had cedars of this variety cut down whose trunks were more than 100 ft. long from the ground to the lowest branches, and 52 in. in diameter. The trees are very resinous; the resin is white and transparent and gives out an agreeable smell like incense when burnt. It appeared to me that this cedar is the commonest and highest tree of the country; its wood is elastic, and I judged it very suitable for making ships' masts." It cannot be doubted that this "cedar" is identical with the kauri. Marion established a shipyard on shore for the preparation of his spars, and, having the utmost confidence in the friendliness of the Maoris, did not hesitate to allow his men to land unarmed. The ending which might have been anticipated came at last. One evening Marion and fifteen officers and men were attacked and massacred, and on the following morning another boat's crew of eleven men was also surprised, only one escaping to warn the others. Marion's successor in command, Lieutenant Crozet, avenged this treacherous massacre by destroying the villages of the Maoris and by shooting many people; but with his reduced numbers he was unable to remove the partly completed masts, some remains of which were seen by Dr. Thomson in 1859, eighty-seven years after the event.

Very early in the nineteenth century a trading intercourse sprang up between the North Island and Sydney, and a small European settlement began to form at the Bay of Islands. This led to a fuller acquaintance with the kauri, at that time

usually called "cowrie" or "kaudi." Samples of the timber were sent to England and attracted much attention. It was suggested that it might prove serviceable for the topmasts of the larger ships in the Navy, for which spars varying from 75 ft. to 85 ft. in length were required; and the Admiralty despatched two ships—the "Dromedary" and the "Coromandel"—to obtain cargoes for experimental purposes. Other consignments were obtained at a later date. A small export trade also sprang up with Sydney, kauri timber being much preferred for building purposes to the Australian timbers then in the market. All this drew attention to the kauri, and by the year 1830 it was generally recognized that few timbers in any part of the world equalled it for durability, ease with which it could be worked, and adaptability to a great variety of purposes. After the establishment of British supremacy and the colonization of the country kauri rapidly took the first place as a commercial timber, a position which it has occupied ever since.

So far as I can ascertain, the first scientific description of the kauri was given by D. Don in the appendix to Lambert's "Pinetum," published in 1824. He recognized its affinity to the Dammar pine of Borneo, and placed it in the same genus under the name of *Dammara australis*. For many years it was almost universally known by that title; but it was eventually pointed out that Rumphius, who first proposed the name of *Dammara* for the Bornean plant in 1741, had never given a definition of the genus, but had simply associated with the Dammar pine two other resin-bearing plants which did not even belong to the *Coniferae*. Under these circumstances, Salisbury's name of *Agathis*, being the earliest accompanied with a sufficient diagnosis, was accepted by Hooker and Bentham in the "Genera Plantarum," and by Eichler in the "Pflanzenfamilien." Finally, at the Vienna Conference, the name of *Agathis* was included in the "Nomina Conservanda," or list of names which in any case must be retained.

Being anxious to ascertain who supplied the specimens described by Don, I induced Mr. Hemsley to trace the matter in the library at Kew. He has supplied me with the following quotation from Lambert's "Pinetum": "For the branch represented in the plate I am indebted to the friendship of John Deas Thomson, Esq., Commissioner of the Navy. It was brought home by Captain Downie, under whose order two ships were sent by the Government some time ago for the purpose of procuring timber for shipbuilding." I have ascertained that Captain Downie was the master of the naval storeship "Coromandel," which visited New Zealand in 1820 for the purpose of obtaining spars for the Royal Navy.

The kauri is almost too well known to need a special description. It is a lofty forest-tree, with a massive columnar trunk and rounded almost bushy head. Its average height is from 50 ft. to 120 ft., with a trunk 4 ft. to 10 ft. in diameter; but it may attain as much as 150 ft. or 170 ft., with a trunk 15 ft. to 22 ft. in diameter. The leaves of the mature trees are crowded along the short stout branchlets, and are from $\frac{3}{4}$ in. to $1\frac{1}{2}$ in. in length. They are of a dull olive-green colour, very thick and coriaceous, and linear-oblong in shape. The leaves of young plants are longer and narrower, 2 in. to 4 in. long by $\frac{1}{4}$ in. to $\frac{1}{2}$ in. broad; but they pass by insensible gradations into those of the older trees. The flowers are invariably monœcious, the males being axillary, and the females terminating short branchlets. The cones are almost spherical when mature, and from 2 in. to 3 in. in diameter. As the scales separate from the axis at maturity, the cones are seldom seen except when a tree is felled.

The kauri has a very limited geographical range. Some scattered trees exist in the North Cape district, especially between Tapotopoto Bay and Whangakea, but it is not found in any quantity to the north of Ahipara and Mongonui. From these two localities southwards to the Manukau Harbour on the west coast and Tairua on the east is the proper home of the tree—the district which for seventy-five years has supplied almost the whole of the kauri timber used in the Dominion or exported therefrom. Its extreme southern limit on the east coast is near Maketu,

in the Bay of Plenty; on the west, in the vicinity of Kawhia Harbour. In the valley of the Thames an extensive kauri forest once existed at Waiorongomai, near Te Aroha, but it has long since been cut down. A few isolated trees, however, still exist on the flanks of the ranges flanking the eastern side of the Thames River, the Gordon Settlement being the southern limit. In the Waikato district scattered trees or small clumps were once not uncommon on the west side of the Waipa near Ngaruawahia, stretching southwards almost as far as Whatawhata. The southern boundary of the kauri can therefore be said to coincide with the 38th parallel of south latitude. As for its altitudinal range, it descends to sea-level in many localities, but it is most abundant from 250 ft. to 1,000 ft. It is not common above 1,500 ft., although it occurs up to 2,000 ft. on the Cape Colville Peninsula, and between Hokianga and the Northern Wairoa.

Although the kauri will flourish in almost all soils and situations, save those which are exceedingly wet, it prefers hilly and somewhat rugged localities, and a poor and decidedly clayey soil. Isolated trees are—or, rather, were—found in almost all forests north of Auckland, but as a rule the tree forms little clumps or small groves rather than continuous forests. These groves may contain from a dozen to a hundred or even several hundreds of trees. Usually they are separated from one another by forest tracts in which few kauris are present. Rarely the groves may almost coalesce, forming a forest in which the kauri is the dominant although by no means the sole tree. Nowadays such instances can hardly be found, for the ravages of more than sixty years of sawmilling, and the gradual spread of settlement, have either swept the forest out of existence or very greatly changed its character and appearance. In many cases what was once a noble and magnificent spectacle has been reduced to a scene of utter ruin and desolation. Those who were fortunate enough to see the kauri forests of the Northern Wairoa and the Hokianga districts as they existed thirty-five years ago will readily agree with Mr. Colenso when he says, "There are few sights more impressive of grandeur than an untouched forest of this stately tree; few more impressive of misery and devastation than a worked-out and abandoned one!" ("Essay on the Botany of the North Island," p. 40).

The physiognomy of a kauri forest has often been described. Perhaps one of the earliest accounts is that given by the illustrious Darwin, who visited New Zealand in 1835, and who was taken to see a patch of kauri then existing not far from the missionary settlement at Waimate, Bay of Islands (see "Naturalist's Voyage," p. 427). Mr. Colenso's paper, quoted above, also contains some excellent remarks; and numerous other publications could be mentioned. But by far the best and most reliable popular account of the kauri is that given by Hochstetter ("New Zealand," pp. 140 to 150). For more recent and more strictly scientific information reference should be made to Mr. Kirk's "Forest Flora," and Dr. Cockayne's "Botanical Survey of the Waipoua Kauri Forest."

A kauri forest, or, rather, a forest containing numerous clumps of kauri, has a very remarkable and distinctive appearance. Even when seen from a considerable distance these clumps are at once recognized by the manner in which they stand far above the adjoining forest, by the peculiar ramification of the trees, and by the dark, dusky-green colour of the foliage. But it is from the interior of the forest that the kauri is seen to the best advantage, and the majestic size and noble proportions of the trees can be best appreciated. On all sides rise the huge columnar trunks, sometimes towering up for more than 80 ft. without a branch, and tapering but slightly from base to summit, smooth, grey, and glistening. At the base of the trunk is the huge mound of debris produced by the fall of the bark, which is regularly cast off in large flakes. It is from this peculiarity that the bole of the kauri is so free from the climbing and epiphytical plants which commonly clothe the stems and lower branches of the larger trees of the New Zealand forest. From the top of the trunk spring the short but immensely thick branches, often given out almost from a single point. These, with the branchlets and foliage, form a high vaulted roof

to the forest, through which a varying amount of daylight filters to the ground. Owing to the great height of the trunk, and the fact that the branches are usually confined to the upper portion, and owing to the further fact that large trees of other species seldom grow plentifully intermixed with the kauris of a particular grove, the forest has an open appearance not usually seen in the New Zealand woodlands. Under the vaulted roof of branches the eye can penetrate far and wide among the massive trunks, which have hence been compared to the pillars of some vast Gothic cathedral.

So much for the physiognomy of the kauri itself. But one of the most distinctive features of a kauri grove of any size is the peculiar nature of the associated vegetation. I have already said that few really large trees grow intermixed with the kauri; but smaller trees and shrubs do, together with certain herbaceous plants and ferns. And wherever a clump of kauri exists these plants are also found, or, at any rate, the greater portion of them. Space will not permit of a full account of this most interesting association of plants, but it will be well to mention the names of the most prominent species composing it. Of shrubs or small trees the most abundant are *Alseuosmia macrophylla*, *Dracophyllum latifolium*, *Senecio Kirkii*, *Coprosma lucida*, *Phebalium nudum*, *Metrosideros florida* and *M. albiflora*, *Myrsine salicina*, *Santalum Cunninghamii*. Of non-shrubby plants the most noteworthy are *Astelia trinervia*, *Gahnia xanthocarpa*, and *Freycinetia Banksii*. In many localities the first of these constitutes the chief undergrowth, and is generally known by the name of "kauri-grass." Among the ferns are *Cyathea dealbata*, *Lomaria discolor* and *L. Frazeri*, and *Lygodium articulatum*.

A young kauri—say, from fifty to a hundred years of age—differs entirely in appearance from the mature tree. It has a narrow-conical and sharply pointed outline, and is furnished for a considerable part of its height with a succession of short slender branches inserted at right angles to the stem. As the tree increases in size the lower branches are successively cast off; but it is only by very slow degrees that the bushy-topped shape of the adult is attained. It is a curious fact that young kauris are not commonly found in the groves of mature trees. Probably the reason is that the amount of light is not sufficient for the growth of the very young tree. The juvenile kauri is usually found on the outskirts of the forest proper, and is accompanied by such trees as *Leptospermum ericoides*, *Weinmannia sylvicola*, *Persoonia Toru*, *Santalum Cunninghamii*, *Knightia excoelsa*, and others. Such localities have very truly been called the nursery of the kauri. Granted sufficient time, this mixture of young kauris and other trees would develop into a forest of mature kauris, and in point of fact the intermediate stages can be observed without much difficulty. The comparative absence of young kauri-trees in a mature kauri grove is, however, somewhat suggestive, for it seems to point to the conclusion that a particular kauri grove, if left to itself, would not maintain its character through the gradual replacement of older trees by younger ones, as is the case in many forests of *Coniferae* in other parts of the world, and as is evidently the case with our own kahikatea.

The probable age attained by a kauri-tree has not been investigated by previous writers with sufficient care, and assumptions have been made for which there is really no proof whatever. Even such a careful observer as the late Mr. T. Kirk hazarded the opinion ("Forest Flora," p. 145) that the gigantic specimen at Mercury Bay, which has a trunk 24 ft. in diameter, "must be considerably over four thousand years," an estimate which is probably more than double the correct amount. Mr. Kirk was also inclined to hold the view that the kauri forms more than a single cylinder of wood during each year, which, if correct, would make the rings of growth of little value for determining the age of the tree. On this latter point, however, direct evidence has recently been obtained. In the year 1865 several kauris and certain New Zealand *Taxads* were planted in the Auckland Domain. In 1905 it became necessary to remove some of them, and, at the suggestion of the writer, Mr. J. Stewart, C.E., obtained cross-sections of the trunks. In all cases the number of concentric

rings of growth agreed with the number of years since the trees were planted. Mr. Stewart's results, which are embodied in a paper printed in the "Transactions of the New Zealand Institute" (vol. xxxviii, p. 374), may be taken as proving that the New Zealand *Gymnosperms* do not produce more than a single well-defined cylinder of woody tissue in each year.

Mr. Laslett, formerly Timber Inspector to the Admiralty, who visited New Zealand for the special purpose of obtaining kauri spars for line-of-battle ships, has published some useful information respecting the rate of growth of small kauris. In his "Timber and Timber-trees" (2nd ed., p. 45) he gives the number of concentric circles, or woody layers, in trunks ranging from 6 in. to 3 ft. in diameter, the average being 13·4 layers to each inch of radius. The cross-sections examined by Mr. Stewart showed forty-two concentric layers for a radius of 6 in., or seven layers per inch. A section of a tree 4 ft. in diameter inspected by myself at Whangarei many years ago showed 188 annual rings for its radius of 24 in., or 7·8 per inch. Another tree, 5 ft. 6 in. in diameter, examined at Coromandel in 1888 showed 280 rings, or 8·5 per inch. Three trees at Waitakarei, measuring 4 ft. 4 in., 5 ft., and 5 ft. 7 in., had 213, 280, and 270 rings respectively, the average of the three being thus 8·2 per inch of the radius. The fine cross-section of a kauri 8 ft. in diameter, presented to the Auckland Museum by Messrs. Leyland and O'Brien, when examined by Mr. Stewart and myself some years ago, proved to have 455 annual rings, or an average of 9·4 per inch. Lastly, a tree recently examined at Waitakarei, measuring 10 ft. 11 in. in diameter, had only 476 rings, an average of 7·3 per inch of the radius. The measurements quoted above throw grave doubts on some of the published statements respecting the age of the kauri. For instance, Mr. Kirk, without actually counting the rings of a complete section, says ("Forest Flora," p. 145), "The age of a tree 7 ft. in diameter must be 1,260 years," whereas the 8 ft. section in the Auckland Museum has only 455 rings. The figures indicate that kauri of serviceable size—that is, with trunks from 2 ft. 6 in. to 4 ft. in diameter—might be produced by trees from 100 to 175 years of age. So far as I am aware, no trunks of a greater diameter than 11 ft. have had their rings of growth counted throughout. It is probable, however, that the number of concentric circles per inch increases as the tree reaches a great age. Trees with a diameter of from 12 ft. to 18 ft. may average about nine or ten annual rings per inch. And, with respect to the Mercury Bay specimen with a diameter of 24 ft., we may fairly conclude that an average of twelve rings per inch might be anticipated, which would make its age 1,728 years. I feel sure that we have no evidence to justify a higher estimate than that.

The wood of the kauri is too well known to require a lengthy description. It is generally admitted to hold the first place among New Zealand timbers, on account of the variety of uses to which it can be applied, from its great durability, and from the ease with which it can be worked. It possesses lightness combined with strength and durability, is firm, close and straight in the grain, is remarkably free from knots and shakes, is easy to plane, taking a particularly smooth and silky surface, and can be readily polished. The investigations made by the Admiralty many years ago proved that for masts and yards it is unrivalled in excellence. To use the words of the late Mr. Laslett, "It not only possesses the requisite dimensions, lightness, elasticity and strength, but is much more durable than any other pine, and will stand a very large amount of work before it is thoroughly worn out" ("Timber and Timber-trees," 2nd ed., p. 390). For general house-building and joinery, sashes, doors, furniture, shop-fittings, carving and ornamental turnery, wharves, bridges, shipbuilding and boatbuilding, it easily takes the first place. It is exceedingly doubtful if any pine timber in any part of the world is capable of such wide application, possesses so many good qualities, and is so relatively free from defects.

The limited range of the kauri, the extent to which the forests have been already depleted, and the very small area of untouched forest still remaining, all point to the early arrival of a time when the output of kauri as a commercial timber must either

cease or be reduced to very small proportions. In 1909 Mr. W. C. Kensington, whose official position as Under-Secretary for Crown Lands gave him unique opportunities of forming a reliable opinion, informed the Royal Commission on Timber and Timber Industries that although the supply of timber generally would last from fifty to sixty years, that of kauri at the then rate of consumption would probably be exhausted in twenty years or thereabouts; and this view is shared by other experts. Under these circumstances, it is a matter for gratification that the Lands Department have set apart the Waipoua Block, between the Northern Wairoa and Hokiangā, as a State forest reserve. It is without doubt the finest specimen left of a really good kauri forest, and should be retained, with proper provision for safeguarding it from fire, as an example of one of the most distinct and noble plant associations that have ever existed. The present generation may not fully appreciate the value of such an endowment, but those who come after us will regard it as a priceless possession, and will fully recognize the enlightened foresight of those who have assisted in preserving such a magnificent remnant of the former kauri forests of north New Zealand.

A few words should be said in reference to the resin of the kauri-tree, ordinarily called "kauri-gum." In a fresh state every part of the kauri is filled with a transparent turpentine, which exudes from the smallest wound. An injury to the bark, a broken branch, even bruised leaves, at once cause a copious flow of this resin. At first soft and viscid, and of whitish colour, it gradually hardens on exposure to the air, and becomes more transparent, forming lumps ranging in size from small tear-drops to irregularly shaped masses often many pounds in weight. These pieces may be found in the axils of the branches or "forks" of the tree, in hollows or depressions on the trunk, or concealed in the hugh mound of debris which accumulates at the base of the tree. But in addition to the resin to be met with in a living kauri forest, very much larger quantities can be found buried at various depths on the sites of previous forests, although these may have ceased to exist for hundreds or even thousands of years. This older resin is much harder, and, as a rule, paler and more transparent than that found in the recent forests. That these deposits are of enormous antiquity can be proved by the changes that have taken place in the physical configuration of the country since they were formed. Kauri-gum has been found under the beds of shallow lakes; it has been dug up in large quantities from considerable depths in swamps; and it has been excavated from strata overlaid by sand-dunes themselves of no very recent formation. As the kauri never grows naturally in low and swampy situations, the presence of the gum in such situations incontestably proves that great physical changes have taken place, involving a great lapse of time. An additional argument in the same direction can be derived from the fact that in not a few localities deposits of kauri-gum have been traced into beds dipping under the present level of the sea; and that on the Auckland Isthmus kauri-gum has been found in strata distinctly older than the volcanic rocks so plentiful thereon.

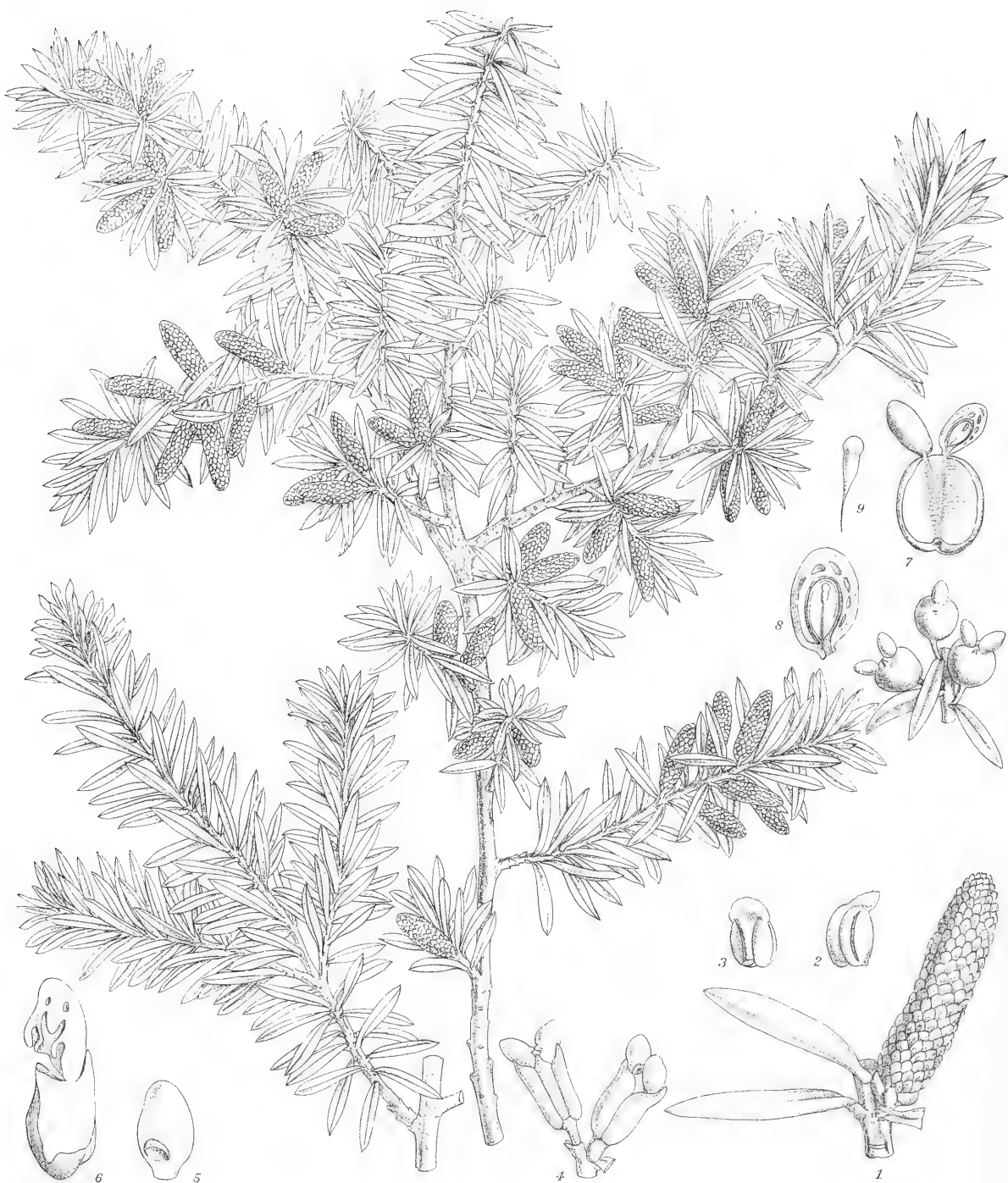
These facts lead to a conclusion of some little scientific importance. What we know of the age of the kauri is sufficient to prove that the existing forests, which contain trees ranging from a few hundreds to nearly two thousand years in age, are in themselves of great antiquity, for we can hardly assume that the trees now living were the first to occupy the forest. But in making this admission we go far towards granting that the chief components of an important plant association may persist from generation to generation for very long periods indeed. And when, as in the case of the kauri, we have proof of the former existence of forests of immeasurably greater antiquity than those living, we may commence to suspect that just as individual species may persist for long ages, so also those groups of species which give a peculiar physiognomy to the vegetation of a country or district may also have an enormous duration in time. May we not reasonably surmise that the kauri forests which clothed the north of New Zealand at the beginning of the Pleistocene period were very similar in composition and appearance to those now

living? Proof of this supposition may not be obtainable at the present time; but, on the other hand, there are many indications to support it.

Kauri-resin is of very great importance in the manufacture of the finest kind of oil varnishes. For that purpose it holds the chief place in the market, and commands a high price. Its export from New Zealand dates back as far as 1847, but for many years the amount shipped was but small, and the price excessively low. Since 1880 the amount exported has ranged from 6,000 to 11,000 tons per annum, the average price being estimated by the Government Statistician at about £50 per ton. The export for 1910 (the latest year available) was 8,693 tons, the declared value being £465,044. At the present time it is estimated that over six thousand people are employed in the digging of kauri-gum.

The genus *Agathis*, of which the kauri is the most important member, contains about eight well-defined species, ranging from the Philippine Islands and Borneo southwards to Australia, western Polynesia, and New Zealand. Its present focus of distribution is evidently Polynesian, for we find two or possibly three endemic species in New Caledonia, one in the New Hebrides, one in the Santa Cruz Group, and one in the Fiji Islands. It is somewhat curious that no species has yet been recorded from New Guinea or the Solomon Islands, but future explorations may remove this apparent anomaly. In any case *Agathis* must be regarded as an important constituent of the Malayan and Polynesian section of the New Zealand flora.

PLATE 184. *Agathis australis*, drawn from specimens supplied by Mr. H. Carse, of Fairburn, Mongonui; the cone forwarded by Mr. J. W. Hall, Thames. Figs. 1 and 2, front and back view of anthers ($\times 5$); 3 and 4, young cone-scale ($\times 5$); 5, cone-scale, with young seed ($\times 3$); 6 and 7, seeds ($\times 3$); 8, seed ($\times 3$); 9, section of same ($\times 3$); 10, embryo ($\times 3$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

PODOCARPUS TOTARA, D. Don.

PLATE 185.—PODOCARPUS TOTARA.

(THE TOTARA.)

FAMILY TAXACEÆ.]

[GENUS PODOCARPUS, L'HERIT.

Podocarpus Totara, G. Benn. ex D. Don in Lamb. Gen. Pin. ed. ii (1832), 189; *Cheesem. Man. N.Z. Fl.* 648.

Although the totara is found throughout the whole length of both the North and South Islands, there is no evidence to show that it was observed by the earlier botanists who visited New Zealand—as Banks and Solander, Forster, Menzies, &c. The first reference I can find—and that a bare mention of the name—is in Nicholas's "New Zealand," published in 1817. The first botanist under whose notice it came was the talented and enthusiastic Allan Cunningham, who gathered it during his first visit to New Zealand, in the year 1826. His diagnosis of the species, published in 1838 in the well-known "Precursor," was the earliest scientific description to appear; but the name *Podocarpus Totara* had been previously applied by D. Don in the second edition of Lambert's "Pinetum," issued in 1832. Don's name, and his remarks respecting the plant, were based on information supplied by Dr. George Bennett, of Sydney, who visited New Zealand in 1829, and who not only formed botanical collections of some importance, but who also gathered a considerable amount of information respecting the natural history of the country and its Maori inhabitants.

The totara does not equal the dimensions of the kauri, but is nevertheless a noble forest-tree 50 ft. to 100 ft. in height, with a trunk ranging from 2 ft. to 6 ft. in diameter, or even more. When growing in full luxuriance the stem is tall, straight, and clean, and is often quite bare for 50 ft. or 60 ft., above which there is a broad crown of horizontally spreading branches. The foliage is dense, and from its dull-brown colour is somewhat unattractive when seen in the mass. The bark is thick and deeply furrowed, stringy and papery, and often horizontally ringed at intervals of a foot or two, especially towards the base of the trunk. The tree attains its greatest size and luxuriance in deep, rich alluvial soils, but it will grow fairly well in a great variety of situations, from the light pumiceous soils of the Taupo plains to stiff retentive clays.

As already stated, the totara is found from the North Cape to Foveaux Strait, but it is often somewhat sparsely distributed, especially to the north of the Auckland Isthmus. It is most abundant in the central portions of the North Island, from the Upper Waikato and Waipa southwards to Lake Taupo, and from thence to the Upper Wanganui, Rangitikei, and Manawatu on the western side of the Island, and to Hawke's Bay and the Wairarapa on the eastern. In several parts of this area it is being so rapidly converted into sawn timber that the once extensive forests are fast being worked out. At the present rate of consumption, totara suitable for milling purposes will be exhausted in about thirty years. Its altitudinal range is from sea-level to 2,000 ft.; but it is seldom found of large size above 1,500 ft. At altitudes greater than 1,500 ft. or 2,000 ft. its place is taken by the allied species or variety *P. Hallii*.

It is generally admitted that next to the kauri the totara produces the most valuable timber in the Dominion. It is exceedingly durable—more so, in fact, than kauri; it is not liable to warp or twist, and is easy to work,

although it does not take such a high finish as the kauri. Its chief defect is its brittleness, which, though not excessive, interferes with its use for purposes where it is subject to heavy strains and stresses. It also suffers more from wear-and-tear than either kauri or rimu. On the other hand, its greater durability makes it valuable for telegraph-poles, house-blocks, window and door frames, and particularly for any outside building-work in contact with the ground. It resists the attack of the *Teredo* better than any other indigenous timber, and in consequence is largely employed for the piles of wharves and marine bridges—a position from which, however, the introduction of ferro-concrete piles is now displacing it. Although very suitable for furniture, its somewhat plain appearance and want of figure handicap its use in comparison with kauri and rimu. A mottled variety, however, is much sought after for ornamental panelling, veneering, &c.

Before the advent of Europeans the totara was the tree most highly valued by the Maoris, or, as Mr. Elsdon Best appropriately puts it, was “the most prized tree of the forest, the foremost of *rakau rangatira*.” Its timber was the best for canoes of all kinds, from the huge *waka-tana*, or war-canoe (often from 60 ft. to 90 ft. in length, and capable of carrying a hundred fighting-men), to the small river or fishing canoes used by but two or three. It was also the timber chiefly used for the elaborately carved houses, of which two kinds were usually seen in the larger Maori villages—the *whare-whakairo*, or guest-house, with its highly decorated interior; and the *pataka*, or storehouse, where the carved work, often exceedingly elaborate, was on the outside of the building. Totara timber was also used for the huge carved gateways (*waharoa*) of the fortified villages, or for the grotesquely carved posts placed in the fence or palisading surrounding them. The bark of the totara was also serviceable in several ways. With care it could be peeled off in long broad strips, which were then employed as roofing; or were folded and tied up into baskets or other vessels in which preserved birds, fruits, &c., could be stored. With the single exception of *Phormium*, it is probable that no plant was so generally serviceable to the ancient Maori as the totara.

The nearest ally of the totara is undoubtedly *Podocarpus Hallii*, or Hall's totara. In point of fact, the two plants are so similar that several botanists refuse to admit their distinctness as species. This view is held by Dr. Pilger, in the monograph of the *Taxaceæ* contributed by him to the “*Pflanzenreich*” (heft 18); and it must be admitted there is much to be said in its favour. Mr. Kirk, who first distinguished *P. Hallii*, relied chiefly on the weak flexuous branches and larger leaves of its young state, the much thinner and more papery bark, the longer peduncles of the male flower, and the more pointed nut. I much fear that the last two characters are not trustworthy, the shape of the nut in particular depending very much on its age, and the length of the peduncle is evidently subject to variation. It is much to be desired that some local botanist would make a careful comparison of the two plants in those localities, such as the Waimarino Forest, near the base of Ruapehu, where they are to be found almost side by side, and where their differential characters can be easily examined.

The geographical distribution of the genus *Podocarpus* presents some interesting features. It attains its extreme northern limit in Japan, from whence three or four species are known. In China and India it is but sparingly distributed; but it is plentiful throughout the greater part of the Malay Archipelago, not less than eight or nine well-defined species having been described. Coming further south, four species occur in New Guinea, two in the Fiji Islands, and no less than seven in New Caledonia. Australia has five species, and New Zealand seven. Altogether, from Japan to New Zealand, about thirty-eight species are known. In Africa the genus extends

from Abyssinia to the Cape; but the number of species is comparatively small, not exceeding eight or nine. In America the genus is better represented, about fifteen species being recorded, but it does not extend further north than the West Indies, and is most plentiful along the chain of the Andes. No doubt the large number of species found in New Zealand, New Caledonia, and Malaya shows that the present centre of distribution of the genus is essentially Malayan and Polynesian; but the presence of the genus in both Africa and America, and its widespread distribution generally, seem to point to an ancient origin. Probably it will be necessary to go well back into Mesozoic times to trace its phylogeny and geographical evolution.

PLATE 185. *Podocarpus Totara*, drawn from specimens collected by Mr. A. Gordon at Ruatangata, Whangarei. Fig. 1, male inflorescence ($\times 4$); 2 and 3, front and back view of anther ($\times 8$); 4, female inflorescence ($\times 4$); 5, ovule ($\times 8$); 6, longitudinal section of female flower and receptacle ($\times 10$); 7, section of fruit and receptacle ($\times 3$); 8, section of nut, showing position of embryo ($\times 8$); 9, embryo ($\times 12$).



M. Smith del.
J.N. Fitch lch.

West, Newman imp.

PODOCARPUS NIVALIS, Hook.

PLATE 186.—*PODOCARPUS NIVALIS*.

(THE ALPINE TOTARA.)

FAMILY TAXACEÆ.]

[GENUS *PODOCARPUS*, L'HERIT.

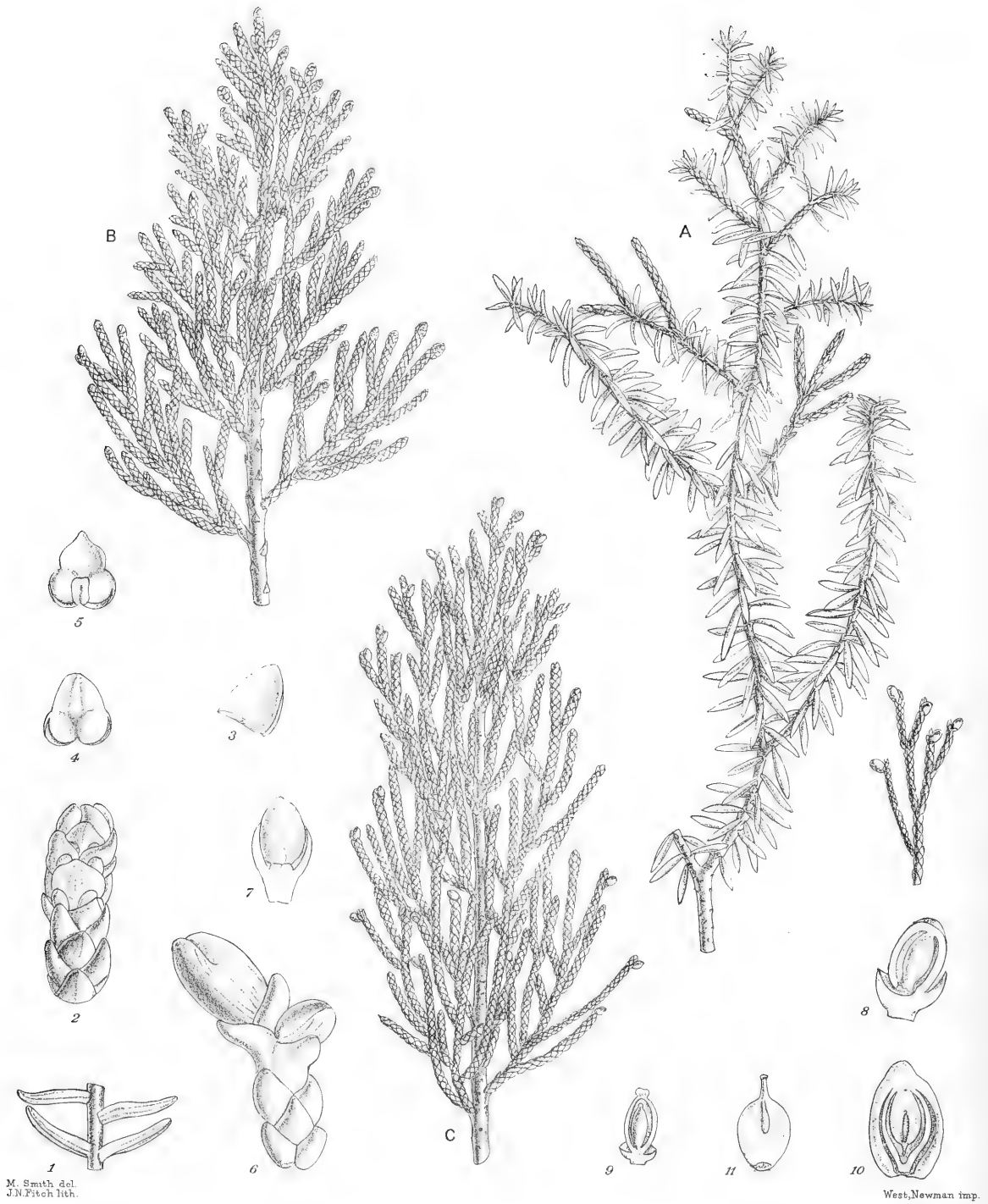
Podocarpus nivalis, Hook. Ic. Plant. t. 582; Cheesem. Man. N.Z. Fl. 649.

Podocarpus nivalis was one of the many interesting plants discovered by Mr. J. C. Bidwill in 1839 on the slopes of Ngauruhoe, which he was the first European to ascend. A single specimen given by him to Mr. Colenso was communicated by that gentleman to Sir W. J. Hooker; and from that slender material the species was described and figured in the "Icones Plantarum," as quoted above. In 1845 Mr. Colenso gathered the plant during his first journey to the Ruahine Mountains, and two years later he also collected it at the eastern base of Tongariro ("Visits to the Ruahine Range," pp. 21 and 39). Since then it has been found to be a most abundant plant on the mountains of both the North and South Islands, in many localities forming a considerable proportion of the subalpine "scrub" at elevations of from 2,500 ft. to 5,500 ft. Its northern limit is the little tract of open moorland which forms the very summit of Moehau (Cape Colville), the altitude of which is a little over 3,000 ft.; but it does not appear again until Mount Hikurangi is reached, in the East Cape district. From thence southwards it is found in all mountain districts of sufficient altitude as far as the south-west of Otago, but apparently it does not cross Foveaux Strait into Stewart Island.

Podocarpus nivalis varies much in size and habit. Occasionally, when growing in sheltered situations, as, for instance, near the upper limits of the beech forests of central and north-west Nelson, it takes the shape of an erect shrub 2 ft. to 8 ft. high, with numerous close-set spreading branches; but usually it forms a depressed much branched shrub from 6 in. to 2 ft. or 4 ft. in height, with very numerous much interlaced prostrate and rigid branches spreading outwards in all directions, the whole plant thus forming a dense springy mat often many feet in diameter. The lower branches give off numerous roots from their under-side, and are also provided with many suberect leafy branchlets. The leaves are small, $\frac{1}{2}$ in. to $\frac{3}{8}$ in. long, erect or suberect, linear-oblong, rounded at the tip but distinctly mucronate, very thick and coriaceous. The flowers are dioecious, the females being solitary and axillary, the males usually 2 to 4 together at the top of a short axillary peduncle, but frequently solitary. The fruit is a small oblong-ovoid nut seated on the top of a bright-red fleshy peduncle.

P. nivalis is allied to both *P. totara* and *P. acutifolius*, but is separated from the first by the small size and different habit, obtuse leaves, and usually clustered male flowers. Its stout spreading habit and thick and coriaceous obtuse leaves at once distinguish it from *P. acutifolius*. Its dimensions are too small to allow its timber to be applied to any economic purpose; but, as remarked by Mr. Kirk in his "Forest Flora," the plant is serviceable from its spreading and rooting habit, which helps to bind the loose surface of steep mountain-slopes.

PLATE 186. *Podocarpus nivalis*, drawn from specimens collected on the Nelson Mountains, at an altitude of 4,000 ft. Fig. 1, portion of branchlet, with leaves ($\times 3$); 2, male inflorescence, the usual short type ($\times 3$); 3 and 4, front and back view of anthers ($\times 7$); 5, male inflorescence, long and slender type ($\times 3$); 6, female flower, with leaf ($\times 3$); 7, female flower, with its peduncle or "receptacle" of two swollen bracts ($\times 8$); 8, front view of ovule ($\times 8$); 9, longitudinal section of ovule ($\times 8$); 10, nut, seated on the enlarged and succulent receptacle ($\times 2\frac{1}{2}$); 11, longitudinal section of nut ($\times 5$); 12, embryo ($\times 10$).



DACRYDIUM BIDWILLII, Hook. f.

PLATE 187.—DACRYDIUM BIDWILLII.

(THE MOUNTAIN-PINE.)

FAMILY TAXACEÆ.]

[GENUS DACRYDIUM, SOL.

Dacrydium Bidwillii, Hook. f. ex T. Kirk in *Trans. N.Z. Inst.* x (1878), 388; *Cheesem. Man. N.Z. Fl.* 653.

As its name denotes, the subject of this plate was one of the many discoveries of Mr. J. C. Bidwill, who was the first botanist to examine the mountain vegetation of the Dominion, and who consequently reaped a rich harvest of novelties. His specimens were gathered in some locality near Nelson, in all probability on the Dun Mountain Range. At that time the mountain species of *Dacrydium* were very imperfectly understood, and in both the "Flora" and the "Handbook" Sir J. D. Hooker included the three species now known as *D. biforme*, *D. Bidwillii*, and *D. Colensoi* under the last-mentioned name. It was not until 1877, as one of the results of a systematic investigation of the New Zealand species of the genus made by the late Mr. T. Kirk, that the specific distinctness of *D. Bidwillii* was established, and Mr. Bidwill's connection with the plant recognized.

Dacrydium Bidwillii has a wide range in mountain districts in New Zealand. It attains its northern limit on the open peaty summit of Mochau (Cape Colville), at an altitude of 3,100 ft., where it is associated with *Podocarpus nivalis*, *Phyllocladus alpinus*, and a considerable number of other sub-alpine plants, which also find in that bare and wind-swept locality their most northerly station. I am not aware of any intermediate locality between Mochau and the summit of Hikurangi, in the East Cape district, where it was gathered by Mr. James Adams in 1897; but it is plentiful in suitable places all round the base of Tongariro and Ruapehu, ascending to the summit of Kakaramaea and Hauhungatahi. It has been gathered by Mr. Colenso on the Ruahine Range, and by Mr. B. C. Aston on the Kaimanawa Mountains. It does not seem to have been recorded from the Tararua Mountains, but it doubtless occurs thereon. It is not uncommon in mountain districts in the South Island, from Collingwood to Foveaux Strait, and is abundant in Stewart Island, where it descends to sea-level. In the North Island, so far as I am aware, it is not found below 3,000 ft.; but in the South Island it is occasionally seen at much lower levels, especially in the Te Anau district, where it descends as low as 800 ft.

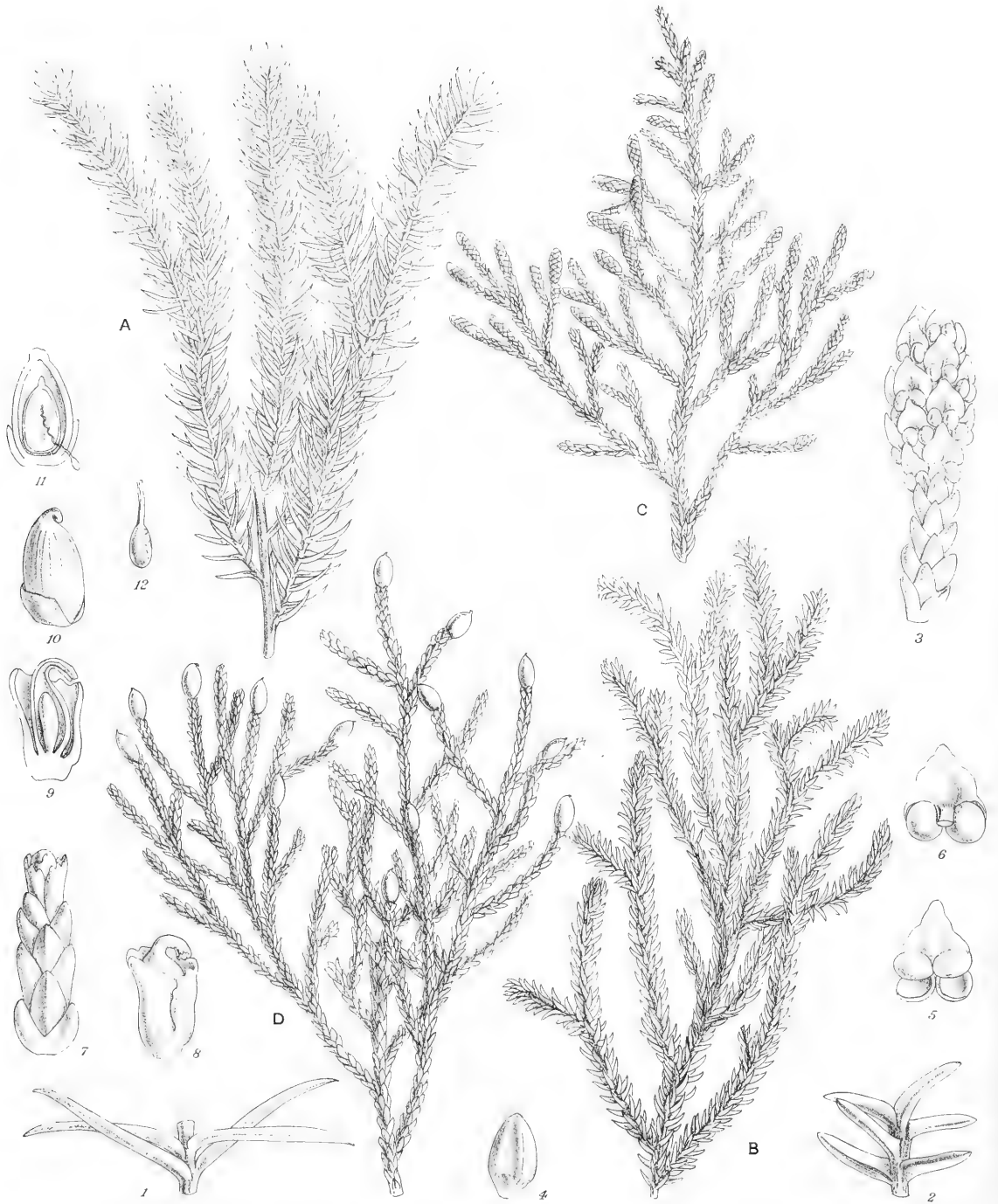
D. Bidwillii varies greatly in size and habit of growth. When surrounded by dense vegetation it often assumes a pyramidal or conical shape, and then attains the stature of a small tree; but when growing in the open, and particularly where it is exposed to strong winds, it forms a broad round-headed shrub, the branches spreading horizontally, the lowermost often rooting at the tips. Mr. Kirk, in the "Forest Flora," describes some remarkable specimens observed by him near the Thomas River, in the Canterbury Alps, which I have also had an opportunity of examining. These form rounded clumps from 2 ft. to 5 ft. in height, and from 10 ft. to 20 ft. in diameter, with a perfectly symmetrical outline, the main branches prostrate and rooting at the tips. Side by side with these were other clumps, consisting of crowded rings of young plants with open centres. No doubt the main trunk had perished through age or through some injury, the rooted tips of the branches providing a ring

of young plants to take its place. As to its habitat, *D. Bidwillii* may either form an appreciable part of the subalpine vegetation on the slopes of the mountains, where the ground is firm and often somewhat stony, or it may grow in peat bogs. In this latter case it is often seen in clumps or scattered singly over a surface covered with *Sphagnum*, *Oreobolus*, *Cerpha*, and other bog-plants.

The great difference between the leaves of the juvenile and adult states of *D. Bidwillii* is well shown in the figure A of the accompanying plate, where it will also be noticed that the larger linear spreading leaves of the juvenile form pass most abruptly into the smaller scale-like imbricating leaves of the adult. In this respect *D. Bidwillii* agrees with *D. biforme* and *D. Kirkii*, and differs altogether from the remainder of the New Zealand species, in which the leaves of the juvenile plant pass by gradual transitions into those of the adult. It should be mentioned that the linear leaves are not confined to young plants, but can always be found on the lower branches of old ones.

The genus *Dacrydium* is better developed in New Zealand than in any other country, no less than seven species out of the sixteen that are known being found in it. Of the remainder, four are from New Caledonia, three from Malaya and the Philippine Islands (one of them being also recorded from the Fiji Islands), one from Tasmania, and a single isolated species from South Chile and Patagonia. These facts seem to point without much doubt to a Malayan and Polynesian origin for the genus.

PLATE 187. *Dacrydium Bidwillii*, drawn from specimens collected on the Nelson mountains, at an elevation of 4,000 ft. A, branch from a young plant; B, from a male plant; C, from a female. Fig. 1, juvenile leaves ($\times 2$); 2, tip of branchlet, with male inflorescence ($\times 4$); 3, leaf from mature branch ($\times 5$); 4 and 5, anthers ($\times 8$); 6, tip of branchlet, with female inflorescence ($\times 6$); 7, female flower ($\times 8$); 8, the same in longitudinal section ($\times 8$); 9, section of ovule ($\times 8$); 10, longitudinal section of nut ($\times 8$); 11, section of seed, showing embryo ($\times 12$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

DACRYDIUM INTERMEDIUM, T. Kirk.

PLATE 188.—DACRYDIUM INTERMEDIUM.

(YELLOW-PINE.)

FAMILY TAXACEÆ.]

[GENUS DACRYDIUM, SOL.

Dacrydium intermedium, T. Kirk in *Trans. N.Z. Inst.* x (1878), 386, t. 20; *Cheesem. Man. N.Z. Fl.* 655.

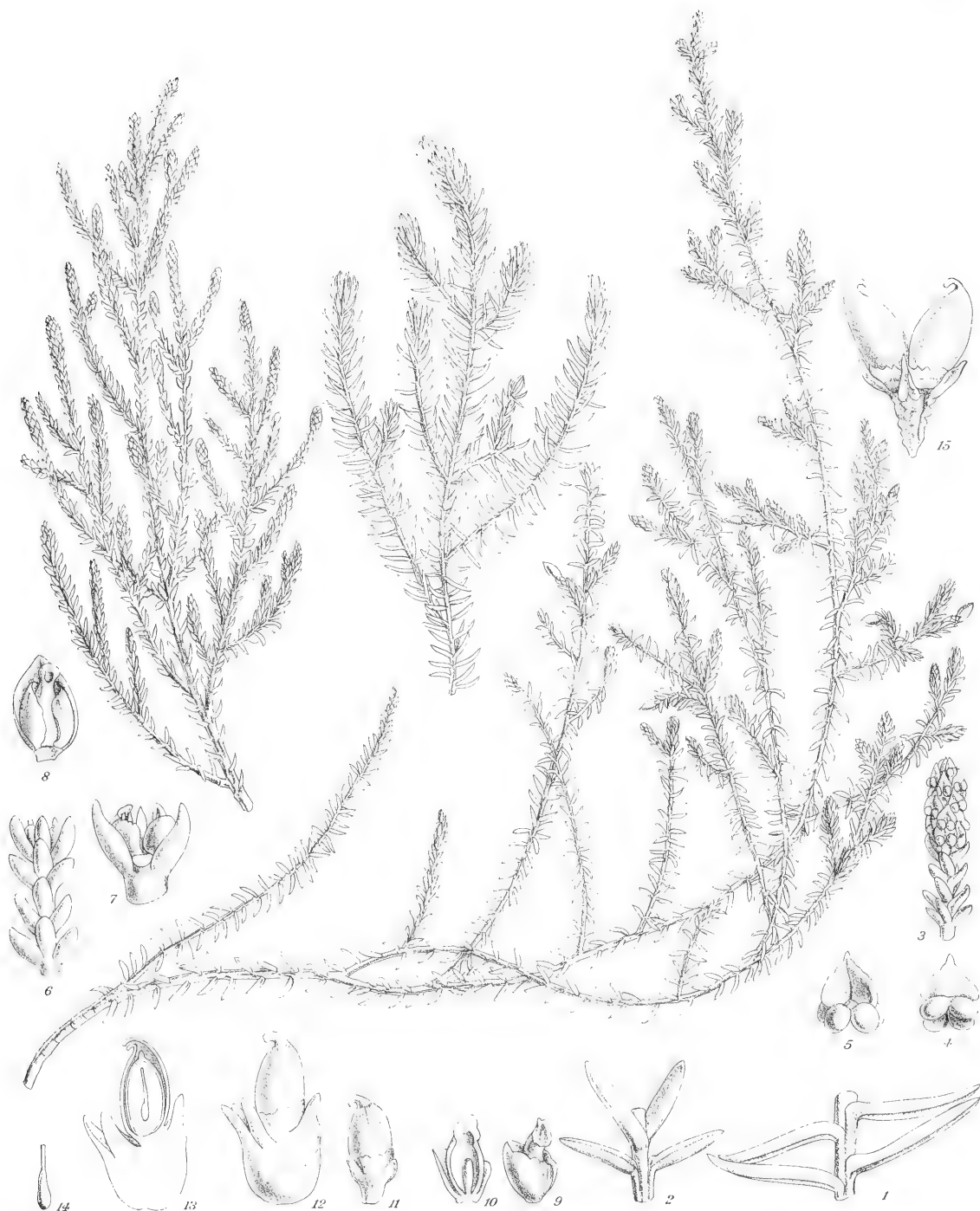
For our first knowledge of this handsome pine we are indebted to the late Mr. T. Kirk. He first observed it in 1867 on the Hirakimata Range, on the Great Barrier Island; and in the following year also detected it on the higher mountains of the Cape Colville Peninsula, where it is not uncommon at an elevation of from 1,700 ft. to 2,500 ft. Further research has shown that it has a wide range. The most northern station that I am acquainted with is the Puhipuhi Forest, between Whangarei and the Bay of Islands, from whence I have seen specimens collected by Mr. R. Mair. It occurs in several scattered localities between the Thames goldfields and Te Aroha Mountain, but has not yet been detected on the Patetere Plateau or in the East Cape district. In the Waimarino Forest it is not uncommon, although not so plentiful as its close ally *D. Colensoi*. I have seen specimens collected on the Ruahine Range by Mr. Colenso and others, and it has been reported from the Kaimanawa and Tararua Mountains. In the South Island it appears to be fairly plentiful on the western side of the Island, from Nelson and Collingwood to the Sounds on the south-west coast of Otago; and it is common on Stewart Island, where it chiefly occurs at low levels. I have seen it at an elevation of fully 4,000 ft. on the Nelson mountains.

The yellow silver-pine, as it is frequently called in Westland, is a small tree 30 ft. to 40 ft. or 50 ft. in height, with a trunk 1 ft. to 2 ft. in diameter, rarely more. In shape it is usually conical, with slightly drooping ultimate branchlets; but when growing on the tops of ridges, or in exposed places generally, it has a shorter trunk with more spreading branches, with stiffer and more crowded erect branchlets. This is the state usually seen on the mountains of the Cape Colville Peninsula, and at first sight looks somewhat different from the taller and more slender form of the Nelson and Westland Districts. The foliage differs greatly at successive stages of the growth of the tree. The leaves of young seedlings are lax and spreading, narrow linear-subulate, acute, curved, and terete, and vary in length from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. (see fig. A. of the accompanying plate). These gradually pass into the leaves of young trees, which are close-set, erecto-patent, $\frac{1}{8}$ in. to $\frac{1}{4}$ in. long, broadly subulate, trigonous, acute (see fig. B). These again pass by imperceptible gradations into those of mature plants, which are densely quadrifariouly imbricate and appressed to the branch, rhomboid, obtuse, keeled, thick and coriaceous, $\frac{1}{15}$ in. to $\frac{1}{10}$ in. long (see fig. C). It is worth mention that in Nelson and Westland young trees still bearing what may be called the second stage of foliage produce flowers and fruit profusely, a peculiarity which I have not noticed in Cape Colville specimens.

D. intermedium produces a timber of great strength and durability. It is straight and even in the grain, very dense and compact, easily worked, and takes a high finish. Together with its near ally *D. Colensoi*, it has been largely used in Westland for railway-sleepers, telegraph-poles, &c., and has been found to give the utmost satisfaction wherever tried; but, unfortunately, the supply is fast becoming exhausted in accessible localities. The timber is also well adapted for furniture and general building purposes.

The nearest ally of *D. intermedium* is undoubtedly *D. Colensoi*, which very closely resembles it in size, mode of growth, and quality and appearance of its timber. But *D. Colensoi* is taller, and has a more conical outline; the trunk is straighter and cleaner; the leaves of young trees are flatter and more distichous; the mature leaves are smaller, and the branchlets more slender; while the nut is smaller, and enclosed almost as far as the middle in the well-developed aril.

PLATE 188. *Dacrydium intermedium*: A, foliage of juvenile plants; B, of young trees; C, male specimen, adult; D, female specimen, adult; the specimens from the Cape Colville Peninsula and the Hope Mountains, Nelson. Fig. 1, leaves of juvenile plants ($\times 4$); 2, leaves of young trees ($\times 4$); 3, tip of branch, with male inflorescence ($\times 4$); 4, leaf of mature tree ($\times 4$); 5 and 6, anthers ($\times 8$); 7, branchlet, with female flower at the tip ($\times 4$); 8, female flower within its scale ($\times 8$); 9, section of the same ($\times 8$); 10, mature nut ($\times 4$); 11, section of same, showing embryo partly detached ($\times 4$); 12, embryo ($\times 12$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

DACRYDIUM LAXIFOLIUM, Hook f.

PLATE 189.—DACRYDIUM LAXIFOLIUM.
(THE PYGMY PINE.)

FAMILY TAXACEÆ.]

[GENUS DACRYDIUM, SOL.

Dacrydium laxifolium, Hook. f. in *Lond. Journ. Bot.* iv (1845), 143; *Fl. Nov. Zel.* i, 234; *Cheesem. Man. N.Z. Fl.* 657.

Dacrydium laxifolium is probably the smallest known pine. I have seen fruiting specimens not more than 3 in. in diameter, and certainly not rising 2 in. above the soil. Usually, however, its trailing stems are from 1 ft. to 3 ft. in length, and, being profusely branched, form mats or carpets 2 ft. to 6 ft. in diameter. It never produces an erect stem; but, as stated by Mr. Kirk in his "Forest Flora," it is sometimes found growing amongst other shrubs, among which its branches may scramble to a height of 3 ft. or 4 ft.

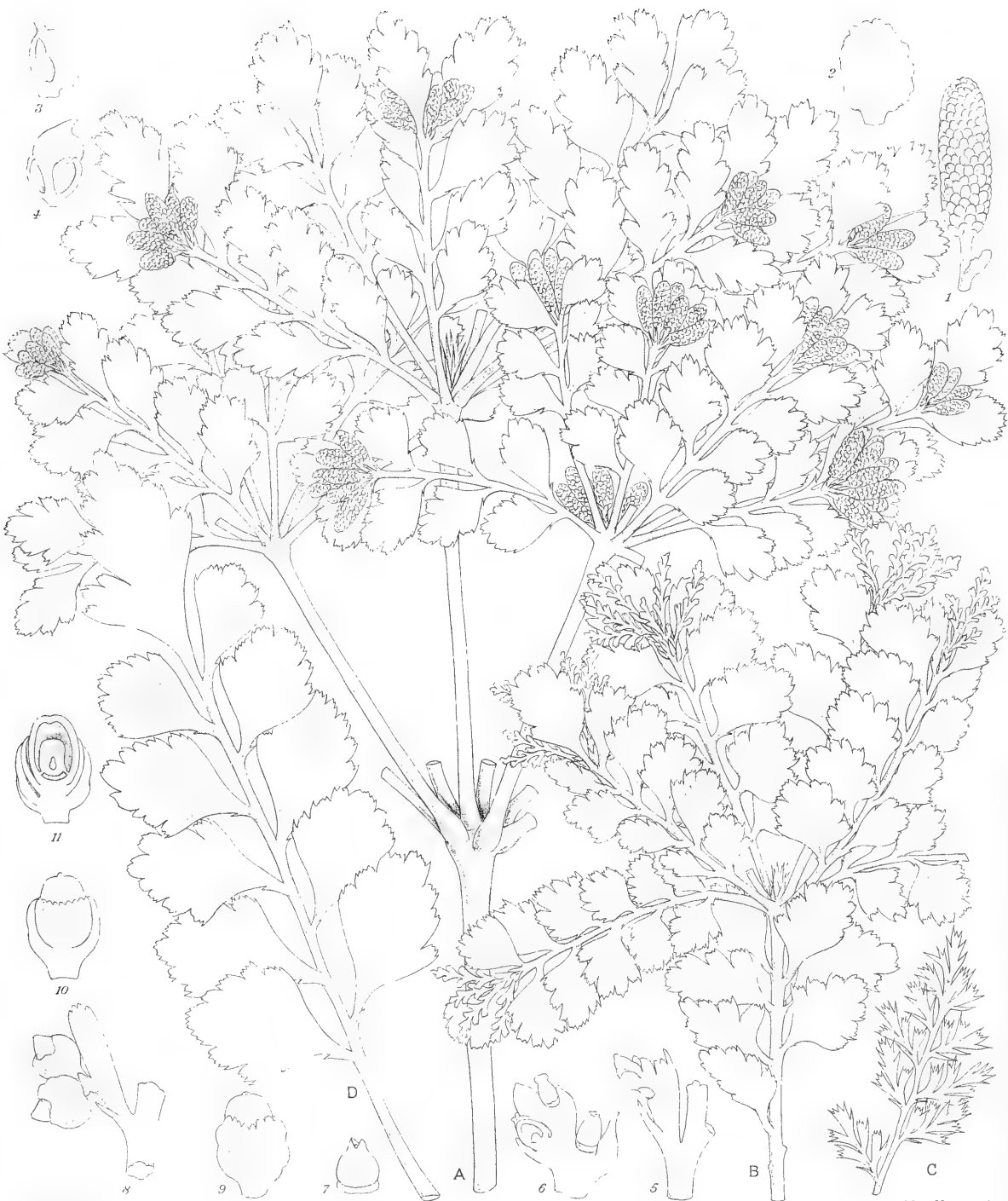
It was originally discovered by Mr. J. C. Bidwill in 1839 near the base of Ngauruhoe, on the central volcanic plateau of the North Island. At page 48 of his "Rambles in New Zealand" he says, "I found here a most curious little plant of the yew family (*Dacrydium*); it was not larger than a clump of moss, and was mistaken for a moss by me when I first saw it." Bidwill's specimens were forwarded to Kew, and the species was described by Sir J. D. Hooker in 1845 under the name it still bears. Some years later it was again collected by Bidwill, this time on the Nelson mountains; and also by Colenso, on the Ruahine Range. So far as is known at present, the northern limit of the species is on Mount Kakaramea, immediately to the north of Tongariro; but there is a strong probability that it exists on the summit of Hikurangi, in the East Cape district. It is not uncommon on the Ruahine and Kaimanawa Mountains, but has not yet been recorded from the Tararua Range. In the South Island it is abundant in mountain districts from Collingwood to the south-west of Otago, usually in moorland swamps. It crosses Foveaux Strait, and attains its southern limit in the Rakiwhaia and Freshwater Valleys, on the west side of Stewart Island. In these two localities it descends almost to sea-level, and grows as a heath-plant on the consolidated surface of ancient sand-dunes. In the North and South Islands it is rarely found below 2,500 ft., and is most abundant between 3,000 ft. and 4,000 ft.

D. laxifolium, like all the New Zealand *Gymnosperms*, has heterophyllous foliage. The juvenile plant, which is represented by the central figure on the accompanying plate, has rather long narrow-linear acute leaves, which are lax and spreading. These, through the growth of the plant, are gradually replaced by shorter and close-set linear-oblong obtuse leaves, which are spreading or suberect. What may be called the mature foliage consists of small ovate or rhomboid imbricating leaves, which, unfortunately, are not clearly represented on the plate. In many plants, and even in some localities, the imbricating leaves are not developed; and even when they are, there is always an abundance of the spreading linear-oblong type.

D. laxifolium, although very distinct from all the other New Zealand species in habit and mode of growth, is nevertheless a close ally of *D. inter-*

medium, with which it agrees in the shape of the juvenile leaves, and in the micropyle of the ovule being elongated and strongly incurved (see figs. 8 to 11 in the accompanying plate).

PLATE 189. *Dacrydium laxifolium*, male, female, and foliage of young plant, drawn from specimens collected on Mount Kakaramea, Taupo, at an altitude of 4,000 ft. Fig. 1, leaves from a young plant ($\times 4$); 2, spreading leaves from an older plant ($\times 4$); 3, tip of branchlet, with male inflorescence ($\times 4$); 4 and 5, anthers ($\times 8$); 6, tip of branchlet, with female inflorescence ($\times 4$); 7, pair of female flowers, with bracts ($\times 7$); 8, single flower, with its bracts ($\times 8$); 9, flower (ovule) seated within its scale ($\times 8$); 10, longitudinal section of same ($\times 8$); 11, mature nut, the "receptacle" not enlarged or succulent ($\times 4$); 12, another specimen, the receptacle greatly enlarged and succulent ($\times 4$); 13, longitudinal section of the same ($\times 4$); 14, embryo ($\times 8$); 15, tip of branchlet bearing two nuts or seeds ($\times 5$).



M. Smith del
J N Fitch lith

West, Newman imp.

PHYLLOCLADUS TRICHOMANOIDES, *D. Don.*

PLATE 190.—PHYLLOCLADUS TRICHOMANOIDES.
(THE TANEKAHA.)

FAMILY TAXACEÆ.]

[GENUS PHYLLOCLADUS, L. C. RICH.

Phyllocladus trichomanoides, D. Don in Lamb. Pin. ed. ii, App. ; Hook. f. Fl. Nov. Zel. i, 235 ;
Cheesem. Man. N.Z. Fl. 658.

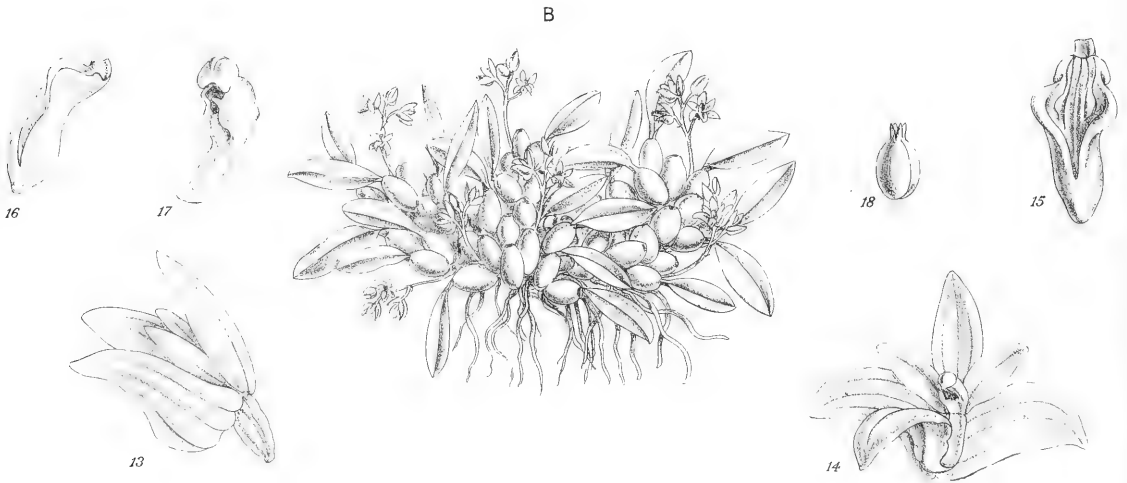
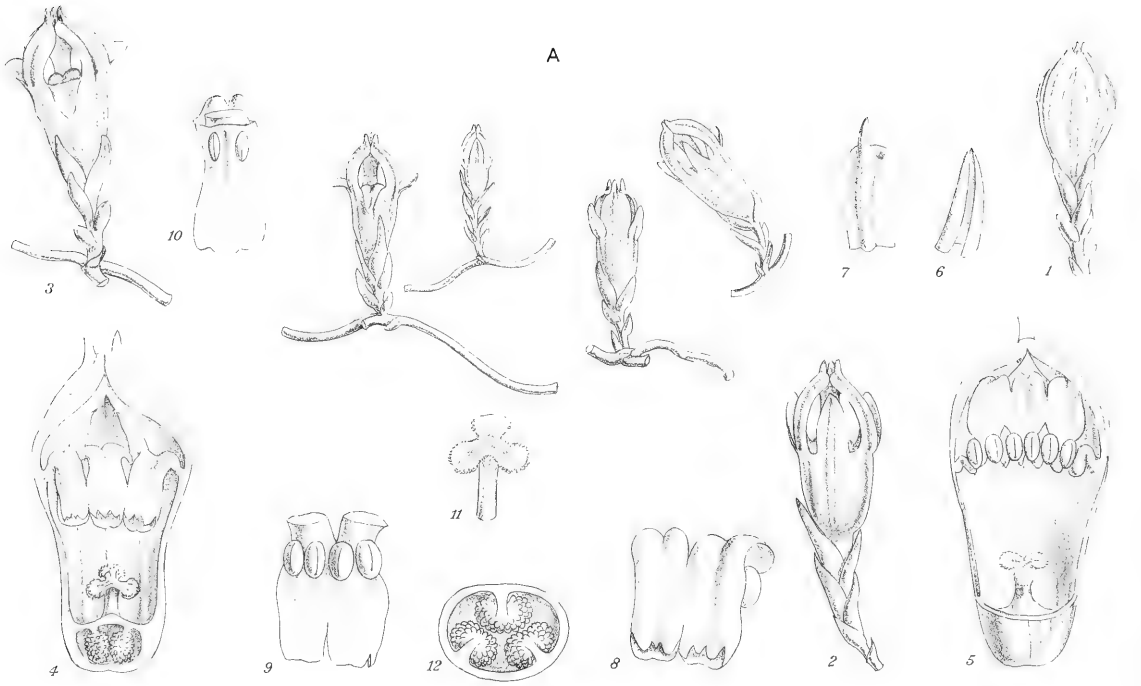
The tanekaha, as it is usually called by Maoris and Europeans alike, is a familiar tree to the residents of North New Zealand, and from its singularly graceful shape and attractive appearance should be more commonly seen in cultivation than is the case at the present time. Its first discovery has been attributed to Banks and Solander, but, I believe, erroneously, for it is neither mentioned in Solander's manuscript Flora, nor are specimens contained in the set of Banksian plants presented to the Dominion by the Trustees of the British Museum. It was, however, collected by Allan Cunningham in 1826, by D'Urville in 1827, and by Dr. G. Bennett in 1829. From specimens and information supplied by the latter a notice of the plant was contributed by D. Don to the second edition of Lambert's "Pinetum" (Appendix), but the first diagnosis under its present name was that given by Allan Cunningham in his "Precursor," published in 1838. In 1843 it was excellently figured by Sir W. J. Hooker in the "Icones Plantarum" (tt. 549-551).

The geographical range of *P. trichomanoides* is limited to the North Island and the extreme north of the South Island. From the North Cape southwards to the Upper Waikato it is tolerably frequent in all forest districts. Further south it is often rare and local, although it extends to the East Cape and Hawke's Bay on the eastern side of the Island, and to Taranaki and the Taranaki Mountains on the western. In the South Island I have gathered it in the Maitai Valley, near Nelson; Mr. Macmahon has sent me specimens collected in the Rai Valley; and many years ago Mr. Kirk collected it in some locality near Picton. On the western side of the Island it has been gathered at West Wanganui by Mr. R. J. Kingsley. It has also been reported from the vicinity of Westport, but I have not seen specimens, and it is not mentioned in Mr. Townson's catalogue of the Westport flora.

The tanekaha attains a height of from 60 ft. to 80 ft. The stem is from 2 ft. to 3 ft. in diameter, and is usually bare for 30 ft. or 40 ft., above which is a regular pyramidal crown of spreading branches. The bark is thick and smooth, and of a dark-brown colour. The timber is yellowish-white, firm, hard and compact, and of much closer grain than the kauri, and of greater specific gravity. It is durable, tough and strong, works up well, and takes a good finish. It is suitable for outdoor work of any kind, and has been used for posts and rails, sleepers, the floors of verandas, and the decking of small vessels, the piles of wharves, and to a small extent for building purposes. The bark, which contains from 20 to 25 per cent. of tannin, is of great value to the tanner, and at one time considerable quantities were exported. It also yields a red dye, formerly often used by the Maoris for dyeing their cloaks, &c. According to Dr. G. Bennett, "the bark is pounded and then placed in a vessel of cold water, into which hot stones are thrown till the water boils. After the bark has been boiled for some hours, the decoction becomes of a dark-red colour; it is then left to cool, when it is strained and ready for use."

The genus *Phyllocladus* contains six well-established species. Of these, three (*P. glaucus*, *P. trichomanoides*, and *P. alpinus*) are endemic in New Zealand; one (*P. asplenifolius*) is confined to Tasmania; another (*P. hypophyllus*) is found in Borneo. The sixth (*P. protractus*) has the widest distribution of any of the species, having been recorded from the Philippine Islands, the Moluccas, and New Guinea. The genus thus ranges from the Philippine Islands to New Zealand, and has a very similar distribution to *Dacrydium*, *Agathis*, and the greater part of the *Podocarpi*, with the exception that it has not yet been detected in New Caledonia or elsewhere in Melanesia.

PLATE 190. *Phyllocladus trichomanoides*, drawn from specimens collected in the vicinity of Auckland. A, branch with male inflorescence; B, branch with female inflorescence; C, cladodes from a young plant; D, cladodes from an unusually large state. Fig. 1, male inflorescence ($\times 2\frac{1}{2}$); 2, bract ($\times 4$); 3 and 4, different views of anther ($\times 6$); 5, portion of female inflorescence ($\times 4$); 6, another portion more highly magnified ($\times 6$); 7, ovule ($\times 8$); 8, portion of fruiting-branch ($\times 2$); 9, ripe nut, the base concealed by an involucre of thick and fleshy scales ($\times 3\frac{1}{2}$); 10, the same with the involucre removed, showing the nut enclosed in a cup-shaped aril ($\times 3\frac{1}{2}$); 11, section of involucre, aril, and nut ($\times 3\frac{1}{2}$).



M. Smith del.
J. N. Pritch lith

West, Newman imp.

A. BAGNISIA HILLII, *Cheesem.*
B. BULBOPHYLLUM TUBERCULATUM, *Col.*

PLATE 191.—BAGNISIA HILLII AND BULBOPHYLLUM TUBERCVLATUM.

FAMILY BURMANNIACEÆ.¹
ORCHIDACEÆ.]

[GENERA BAGNISIA, BECC., AND
BULBOPHYLLUM, THOUARS.

Bagnisia Hillii, *Cheesem. in Kew Bulletin* (1898), 420; *Trans. N.Z. Inst.* xli (1909), 140.

Bulbophyllum tuberculatum, *Col. in Trans. N.Z. Inst.* xvi (1884), 336; *Cheesem. Man. N.Z. Fl.* 661.

Bagnisia Hillii, originally discovered by Mr. H. Hill in 1903, is probably the most interesting addition made to the New Zealand flora during the last ten years, for it adds another family to the list of those known to occur in the Dominion. It is a small colourless saprophyte, usually found on the mound of decaying leaves and humus which accumulates at the base of the trunk of the kahikatea (*Podocarpus dacrydioides*). On account of its small size it is easily overlooked, even in the flowering season, the flowers being often concealed by fallen leaves. The creeping rhizome is from 2 in. to 4 in. in length, and is usually more or less branched. Here and there it puts up erect or curved peduncles bearing 3 to 5 minute scale-like leaves or bracts, and terminating in a single rose-pink flower. This is large for the size of the plant, being from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. in length. Its appearance is decidedly bizarre, the three inner segments of the perianth, which are widely separated at the middle, being tightly connivent at the tips, thus giving the flower somewhat of the look of a bishop's mitre, or perhaps of a lantern with three elliptical windows or openings. In the bud, or in the newly expanded flower, the three outer segments partly close these openings, but ultimately they spread outwards and become sharply reflexed. The structure of the andræcium is most peculiar, and deserves careful study. There are six stamens, which are abruptly deflexed within the perianth-tube (see fig. 4). The filaments are short, and quite free; but the connectives of the anthers are much enlarged, and, being connivent at their margins, form a broad membranous tube. On account of the curious manner in which the stamens are deflexed, this tube lies parallel to the inside of the perianth-tube, the tips of the connectives pointing to the base of the flower, and the minute anthers opening into the narrow space between the connective-tube and the wall of the perianth-tube. The ovary is inferior, 1-celled, with three free placentas; the style is short and stout; and the stigma is deeply 3-lobed. The fruit is unknown.

So far *Bagnisia Hillii* has only been found in dense forests at Opepe, about fifteen miles to the eastward of Lake Taupo. When first discovered by Mr. Hill only a few imperfect specimens were observed, and although he made a second expedition in the same year, during which I accompanied him, we failed to obtain more than one or two damaged flowers. But in January, 1907, Mr. Hill, accompanied by Mr. A. Hamilton, paid another visit to the locality, and was fortunate enough to find a considerable number of specimens in full flower, most of which he very kindly forwarded to me, and which have proved of the greatest service in the preparation of this plate.

Much attention has been paid to the *Burmanniaceæ* of late years, the American species in particular having been worked up by Warming, and by Urban in his elaborate "Symbolæ Antillanæ." From a recent classification

of the family given in part 2 of the "Nachtrag" to Engler and Prantl's "Natürlichen Pflanzenfamilien," it appears that sixteen genera, with about seventy-five species, are now known. The distribution of the family is mainly tropical; but it stretches northwards as far as China and Japan in the Old World, and Virginia in the New. It attains its southern limit in New Zealand and Tasmania. The genus *Bagnisia*, in which I have placed Mr. Hill's plant, contains three other species—one from Bornco, one from Java, and the third from New Guinea.

Bulbophyllum tuberculatum, the second species figured on the accompanying plate, is a charming but little-known plant. It was first described by Mr. Colenso in 1884, from specimens collected by Mr. A. Hamilton at Petane, Hawke's Bay. At a later date Mr. Hamilton also gathered it in woods near Palmerston North. It has since been found near Kaitaia by Mr. R. H. Matthews, in the Lower Waikato by Mr. Carse, in the East Cape district by Mr. L. Wall, and near Collingwood by Mr. Dall. In all probability it is not uncommon in forest districts in the North Island and the northern portions of the South Island; but as it is principally found on the upper branches of tall forest-trees it is not at all easy to detect its presence. Although agreeing in habit with *B. pygmaeum*, it differs in the larger size, 2-4-flowered peduncles, and larger flowers with a bright orange-red lip. The lip of *B. pygmaeum* is always white.

PLATE 191A. *Bagnisia Hillii*, drawn from specimens collected by Mr. H. Hill in forests at Opepe, near Lake Taupo. Fig. 1, flower-bud just previous to expansion ($\times 2$); 2, flower in a more advanced stage, the outer perianth-segments commencing to spread outwards ($\times 2$); 3, fully mature flower, the outer perianth-segments reflexed ($\times 2$); 4, section of flower, showing the stamens sharply deflexed within the perianth-tube, the anthers concealed behind the greatly expanded and connivent connectives ($\times 4$); 5, the same with the stamens turned upwards, showing three pairs of anther-cells ($\times 4$); 6, outer perianth-segment ($\times 3$); 7, inner perianth-segment ($\times 3$); 8, a pair of stamens seen from the inside of the perianth-tube ($\times 8$); 9, the same seen from the other side, showing the anther-cells ($\times 8$); 10, a single stamen with dehiscent anther-cells ($\times 8$); 11, stigma ($\times 6$); 12, section of ovary, showing the three parietal placentas and the numerous ovules ($\times 6$).

PLATE 191B. *Bulbophyllum tuberculatum*, drawn from specimens collected near Kaitaia by Mr. R. H. Matthews. Figs. 13 and 14, different views of flower ($\times 8$); 15 and 16, front and side view of lip (greatly enlarged); 17, column (greatly enlarged); 18, ripe capsule ($\times 4$).



A. THELYMITRA LONGIFOLIA, Forst.
 B. THELYMITRA PULCHELLA, Hook f.

West, Newman imp.

M. Smith del.
 J. N. Fitch lith.

PLATE 192.—THELYMITRA LONGIFOLIA AND
THELYMITRA PULCHELLA.

FAMILY ORCHIDACEÆ.]

[GENUS THELYMITRA, FORST.

Thelymitra longifolia, Forst. Char. Gen. 98, t. 49; Hook. f. Handb. N.Z. Fl. 270; Cheesem. Man. N.Z. Fl. 669.

Thelymitra pulchella, Hook. f. Fl. Nov. Zel. i, 244; Cheesem. Man. N.Z. Fl. 670.

For the first discovery of *Thelymitra longifolia* we have to go as far back as October, 1769, when it was gathered at Tolaga Bay by Banks and Solander during Cook's first voyage. Solander, in his manuscript "*Primitiæ Floræ Novæ Zelandiæ*," described it under the name of *Serapias regularis*; but as this work was never actually published his names have no standing in botanical literature. It was also collected by the two Forsters in Cook's second voyage, but in what locality is not stated, although it must have been either in Queen Charlotte Sound or Dusky Bay. After their return it was published in their "*Characteres Generum Plantarum*" under the name it bears at the present time. It has been observed by almost all subsequent botanists, and is now known to range from the Three Kings Islands and the North Cape southwards to Stewart Island and the Auckland Islands. It is common at sea-level, and ascends the mountains to a height of over 4,000 ft. Although mainly a heath-plant, and nowhere more abundant than on the *Leptospermum*-clad hills that form such a large percentage of the northern part of the North Island, it is really found in all soils and situations, with the exception that it does not occur in dense forests, although occasionally seen in light bush. When it is mentioned that in addition to lowland heaths it is also plentiful on sand-dunes, ledges on seaciffs, the margins of swamps, subalpine meadows, &c., it will be seen that its range of habitats is remarkably wide. It is said to have an extensive range in Australia; but the specimens I have seen from thence hardly match those from New Zealand, and if really belonging to the same species should be treated as a different variety. It has also been recorded from New Caledonia.

T. longifolia falls into a section of the genus known as *Cucullaria*, in which the column-wing is produced behind the anther, and overtops it in the form of a hood-shaped projection furnished with lateral lobes. It is distinguished from the other species of the section by the very large middle lobe of the column-wing, which forms a smooth rounded hood projecting over the anther, and which considerably overtops the lateral lobes, which are closely and densely ciliate at their tips. In the allied species of the section the lateral lobes are longer than the middle lobe, which does not form such a prominent hood. It is very variable in size, stoutness, and number of flowers, varying from less than 6 in. in height, with a single small flower, to 18 in. or 20 in., with twelve to fifteen large flowers. The colour of the flowers is mainly white, with a greenish-purple tinge on the back of the three outer perianth-segments; but some varieties have blue flowers, and others pinkish-red. For an account of the fertilization, see a paper by myself in the "*Transactions of the New Zealand Institute*" (vol. xiii (1881) 291).

Thelymitra pulchella was originally discovered by Mr. Colenso in the North Island, but I am ignorant of the exact locality. It was first published by Sir J. D. Hooker in the "*Flora Novæ Zelandiæ*"; but Hooker bracketed with Colenso's plant some specimens collected by Lyall in Otago; and in the

"Handbook" he also included a plant gathered by Sir D. Monro in the Nelson Provincial District. But although I have examined a great number of *Thelymitra* from the South Island I have found none with the characters of *T. pulchella*, and am inclined to doubt the occurrence of the species to the south of Cook Strait. In fact, I have not seen undoubted specimens of *T. pulchella* from the south of the Waikato River. North of Auckland it is common on *Leptospermum*-clad hills, often associated with *T. longifolia*, and is particularly abundant between the Bay of Islands and the North Cape. I have not seen it at a greater elevation than 800 ft.

T. pulchella belongs to the section *Macdonaldia*, in which the column-wing extends behind the anther, but is shorter than it, and is not hood-shaped; and the lateral lobes, though often toothed or fimbriate, do not possess the dense tufts of cilia so obvious in the section *Cucullaria* (compare figs. 1 and 9 of the accompanying plate). It is one of the handsomest of the New Zealand species, from the large size of the blue-purple flowers, which are often an inch in diameter or even more.

The centre of distribution of the genus *Thelymitra* is in Australia, from whence thirty species are known. New Zealand contains eleven, and additional species will be recorded. As already stated, the New Zealand and Australian *T. longifolia* (or an allied form) occurs in New Caledonia, and there is an outlying species (*T. javannica*, Blume) in Java.

PLATE 192A. *Thelymitra longifolia*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, side view of column; 2 and 3, front views of same; 4, lateral lobe of column, terminated by a dense mass of cilia; 5, some of the cilia; 6, dehiscent anther. (All magnified.)

PLATE 192B. *Thelymitra pulchella*, drawn from specimens collected near Mongonui Harbour. Fig. 7, front view of column; 8, back view of same; 9, side view of same; 10, dehiscent anther. (All enlarged.)



M. Smith del.
J.N. Pritch lith.

West, Newman imp.

A. *THELYMITRA UNIFLORA*, Hook. f. 1-3.
B. *PRASOPHYLLUM COLENSOI*, Hook. f. 4-8.

PLATE 193.—THELYMITRA UNIFLORA AND
PRASOPHYLLUM COLENZOI.

FAMILY ORCHIDACEÆ.]

[GENERA THELYMITRA, FORST., AND
PRASOPHYLLUM, R. BR.]

Thelymitra uniflora, Hook. f. *Fl. Antart.* i, 70; *Cheesem. Man. N.Z. Fl.* 672.

Prasophyllum Colensoi, Hook. f. *Fl. Nov. Zel.* i, 241; *Cheesem. Man. N.Z. Fl.* 675.

Thelymitra uniflora was first observed on the Auckland Islands by Lieut. Le Guillon, one of the officers of the French exploring-ships "Astrolabe" and "Zélée," which, under the command of Admiral D'Urville, visited the Islands in March, 1840. Le Guillon's specimens were very imperfect; but in November of the same year it was again collected by Sir J. D. Hooker during the Antarctic voyage of Sir J. C. Ross. In 1844 it was published by Hooker in the "Flora Antartica" under the name it still bears. It was first gathered in New Zealand proper by Dr. Lyall, at Milford Sound; and shortly afterwards in eastern Otago by Mr. Buchanan. Since then it has been found to be abundant on the margins of peaty swamps or on damp, open, elevated moorlands as far north as Rotorua. It descends to sea-level in Stewart Island and in several localities in the South Island, but is most abundant between 2,000 ft. and 3,500 ft. It is specially plentiful on the Waimarino Plateau, to the west of Tongariro and Ruapehu, where in the month of January every peaty swamp is adorned with its dark-blue flowers.

T. uniflora belongs to Lindley's section *Biaurella*, in which the column-wing does not extend behind the anther, but has two prominent erect lateral lobes. In *T. uniflora* these lobes are more or less spirally involute, as shown in figs. 1 and 2 of the accompanying plate, and are sometimes connected by a crest at the back of the anther (see fig. 2). Its nearest ally is undoubtedly the Tasmanian *T. cyanea*, if, indeed, the two plants are not identical.

Prasophyllum Colensoi, as its name indicates, was one of the many discoveries made by Mr. Colenso, but I am not aware of the exact habitat in which it was first found. This, however, is not of any great importance, seeing that it is now known to extend from the North Cape to Antipodes Island, and to be one of the most abundant orchids in subalpine moorlands. Whether the form so generally distributed in mountain districts at elevations ranging from 2,000 ft. to 5,000 ft., and which must be taken as the type of the species, is quite the same as that which is sparsely found in lowland situations, and which extends to the extreme north of the Dominion, is not quite certain. The question cannot be settled until a detailed comparison of fresh specimens has been made.

P. Colensoi belongs to the typical section of the genus, called by Bentham *Euprasophyllum*, in which the lip is sessile at the base of the column. The only other species of the section found in New Zealand is the Australian *P. patens*, which differs in its much greater size, larger paler flowers, and longer lip, which has a much larger recurved lamina, the adnate plate not extending almost to the tip, as it does in *P. Colensoi* (see fig. 8 of the accompanying plate). The nearest ally of *P. Colensoi*, however, is probably the Tasmanian plant described by R. Brown under the name of *P. alpinum*, but which Bentham, in the "Flora Australiensis," merges with *P. fuscum*.

The genus *Prasophyllum* contains about thirty-five species. Of these, thirty-two are found in Australia (including Tasmania), four in New Zealand, two of which are apparently identical with Australian species, and one (*P. calopterum*, Rchb. f.) in New Caledonia.

PLATE 193A. *Thelymitra uniflora*, drawn from specimens collected on the Waimarino Plains, at the western base of Ruapehu; altitude 3,000 ft. Fig. 1, front view of column; 2, back view of same; 3, dehiscent anther. (All enlarged.)

PLATE 193B. *Prasophyllum Colensoi*, drawn from specimens obtained in the same locality as the preceding. Fig. 4, two flowers ($\times 5$); 5, the two lateral sepals, connate below the middle ($\times 8$); 6, one of the petals ($\times 8$); 7, side view of lip and column ($\times 10$); 8, front view of same ($\times 10$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

A. PRASOPHYLLUM PUMILUM, Hook. f. 1-5.
B. PTEROSTYLIS TRULLIFOLIA, Hook. f. 6-12.

PLATE 194.—PRASOPHYLLUM PUMILUM AND
PTEROSTYLIS TRULLIFOLIA.

FAMILY ORCHIDACEÆ.]

[GENERA PRASOPHYLLUM, R. BR., AND
PTEROSTYLIS, R. BR.

Prasophyllum pumilum, Hook. f. *Fl. Nov. Zel.* i, 242; *Cheesem. Man. N.Z. Fl.* 675.

Pterostylis trullifolia, Hook. *Fl. Nov. Zel.* i, 249; *Cheesem. Man. N.Z. Fl.* 682.

Prasophyllum pumilum was originally discovered by Mr. J. Edgerley, a gentleman of considerable scientific attainments, who collected plants in the northern portion of New Zealand in the years 1841-42, and who forwarded his specimens to Sir W. J. Hooker at Kew. I do not know the exact station in which Mr. Edgerley obtained the species, but as his travels were confined to the district between the Hauraki Gulf and the Bay of Islands it must have been somewhere within those limits. A little later it was gathered by Mr. Colenso, probably at the Bay of Islands; and, according to the "Hand-book," it was collected in the vicinity of Auckland by Dr. Sinclair. Its southern limit, so far as I am aware, is on the *Leptospermum*-clad hills between Rangiriri and the Whangamarino River, where I observed it many years ago. Both Mr. Kirk and myself have gathered it in several stations near Auckland, although (as in *all* its localities) in small quantity. I have also collected it at Coromandel, in several stations between Helensville and Port Albert, at Whangarei, at the Bay of Islands, and at Mongonui. Mr. R. H. Matthews and Mr. Carse have both found it to be "not uncommon" near Kaitaia, and Mr. Kirk has recorded it from the tract of country between Parengarenga and the North Cape. It is purely a heath-plant, and I have never seen it except on the comparatively bare clay hills which are so frequent in the North Auckland Peninsula, and which, from the quantity of kauri-resin that has been dug from them, are locally known as "gum-lands." The vegetation on these hills is mainly composed of stunted *Leptospermum scoparium*, mixed with varying proportions of *Pomaderris phylicæfolia* and *P. elliptica* (and less commonly *P. Edgerleyi*), *Leucopogon fasciculatus*, *Dracophyllum Urvilleanum*, and other shrubs, together with some sedges, *Pteris aquilina*, and several small herbaceous plants. It is in open places of perhaps a yard or so in extent, often covered with *Campylopus* and other mosses, that the *Prasophyllum* is usually found.

Prasophyllum pumilum belongs to an altogether different section of the genus to that which includes *P. Colensoi*, figured in the previous plate, and which bears the name of *Genoplesium*. In it the lip is articulated on to a flat ribband-like projection from the base of the column, and is more or less mobile. Its nearest ally, according to Hooker, is the Tasmanian *P. despectans*, with which I am not acquainted; but it is also comparatively close to the New Zealand plant which I have for the present referred to the Australian *P. rufum*, but which differs from *P. pumilum* in the horizontal (not deflexed) flowers, in the narrower lip and lateral sepals, the latter being tipped by a minute gland, and in the narrower lateral lobes of the column.

Pterostylis trullifolia is another of the discoveries made by Mr. J. Edgerley, having been collected by him at the Bay of Islands in 1841. About the same time, or very shortly afterwards, it was gathered by Mr. Colenso in

the same district. Since then it has been observed by every botanist who has examined the vegetation of the northern portion of the North Island, for, so far as the district to the north of the Bay of Plenty and Kawhia is concerned, it is one of the most abundant of the terrestrial orchids. In the southern portion of the North Island it is decidedly rare and local, although it extends to the neighbourhood of Wellington. In the South Island the only locality yet recorded is Mount Peter, in northern Marlborough, where it was detected some years ago by Mr. J. H. Macmahon.

P. trullifolia has a somewhat wider range of habitats than *Prasophyllum pumilum*. Although often found on *Leptospermum*-clad hills, it requires more shade than the *Prasophyllum*, and delights in sheltered nooks in tall *Leptospermum*, where there is a plentiful supply of humus and not too much moisture. It is also common in mossy places in tolerably dry and open forest, but is seldom seen where the forest is thick and dense. Its altitudinal range is from sea-level to 2,000 ft. or a little more. Two well-marked varieties are commonly seen. The first, which must be regarded as the type, has a rather large flower often an inch in length, and the petiolate radical leaves are usually present in flowering specimens, and frequently very numerous in barren ones, forming a conspicuous rosette. The other variety, which may be distinguished as var. *gracilis*, is taller and more slender, with a smaller flower varying from $\frac{1}{2}$ in. to $\frac{2}{3}$ in. in length; the cauline leaves are narrower, the radical leaves are seldom present in flowering specimens, and in barren plants are fewer in number and smaller. Both varieties are figured in the accompanying plate.

The genus *Pterostylis* has a very similar geographical distribution to that of *Thelymitra* and *Prasophyllum*. It contains approximately about fifty species, of which thirty-six or thirty-seven are Australian. Eleven species are found in New Zealand, two of them being the same as Australian forms; three are known from New Caledonia, one of them being probably identical with an Australian species; and a single species (*P. papuana*, Rolfe) is found in New Guinea.

PLATE 194A. *Prasophyllum pumilum*, drawn from specimens collected by Mr. R. H. Matthews near Kaitaia, Mongonui County. Fig. 1, two flowers; 2, the two lateral sepals, connate at the base; 3, lateral petals, lip, and column; 4, side view of lip and column; 5, front view of column, with the ribband-like base of the lip. (All enlarged.)

PLATE 194B. *Pterostylis trullifolia*, drawn from specimens collected in the vicinity of Auckland. Fig. 6, flower ($\times 1\frac{1}{2}$); 7, a single petal ($\times 2$); 8, lip and column ($\times 4$); 9, lip with its appendix ($\times 6$); 10, front view of column, with the wings spread open ($\times 6$); 11, tip of appendix to the lip, highly magnified.



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

PTEROSTYLIS BANKSII, R.Br.

PLATE 195.—PTEROSTYLIS BANKSII.

FAMILY ORCHIDACEÆ.]

[GENUS PTEROSTYLIS, R. BR.

Pterostylis Banksii, R. Br. ex A. Cunn. in Bot. Mag. t. 3172; Hook. f. Fl. Nov. Zel. i, 248; Cheesem. Man. N.Z. Fl. 679.

Pterostylis Banksii, which is by far the finest species of the genus found in New Zealand, was first discovered by Banks and Solander at Mercury Bay in November, 1769, during Cook's first voyage. Solander, in his manuscript Flora of New Zealand, referred it to the genus *Arethusa*, but gave no detailed account of it, for he supposed that it was identical with an Australian plant described in another part of his manuscripts. It was not again seen until 1826, when the talented and enthusiastic Allan Cunningham gathered it on the banks of the Kawakawa River, Bay of Islands. Since then it has been found to range through almost the whole length of the Dominion, from the North Cape to Stewart Island, and from sea-level to nearly 4,000 ft.

P. Banksii is usually found along the sides of lightly wooded gullies, or on the margin of forest lands, and sometimes occurs in considerable quantities. It is variable in size, sometimes attaining a height of quite 18 in. or even more, at other times barely reaching 6 in. Specimens of the sizes quoted above have been collected by myself in a single locality growing under uniform conditions; but, speaking generally, the taller specimens are found in sheltered places along the sides of ravines, and the smaller in more open situations. The large green flowers, often streaked with red or reddish-brown, and with the three sepals all furnished with long filiform tails, have a most curious and bizarre appearance, and always attract the notice of strangers when seen for the first time.

The remarkable fertilization of *Pterostylis* was first described by myself in the "Transactions of the New Zealand Institute" (vol. v, p. 352 *et seq.*). The upper sepal and petals are connate into a hood, at the back of which the column is placed. The tip of the lip, which is extremely sensitive, hangs out of the entrance to the flower, thus forming a convenient landing-place for insects. When touched by an insect it springs up, carrying the insect with it, and thus enclosing it within the flower. The position then occupied by the lip is that shown in fig. 2 of the accompanying plate, and the insect is enclosed in the space between the lip and the column. The hood-like flower prevents any escape to the right or left of the lip, and as the lip remains closely appressed to the projecting wings of the upper part of the column as long as the insect is present, the only mode of escape is by crawling up the front of the column and passing between the wings (see fig. 4). In doing this, it is first smeared with viscid matter from the rostellum, which projects at the back of the passage between the wings, and then drags away the pollinia, which can hardly fail to adhere to its sticky body. When visiting another flower it must pass over the stigma before escaping, and can hardly fail to leave some of the pollinia on its viscid surface. From the above, it is clear that the fertilization of the flower depends entirely on the irritability of the lip. With the view of proving this, on one occasion I removed the lip from twelve flowers while young, so that insect visitors would not be compelled to crawl out of the flower by the passage between the wings of the column. When these flowers commenced to wither they were examined, when it was found that they were not fertilized, and that not a single pollen-mass

had been removed from the anther. I have also repeatedly placed minute insects on the lip, thus causing them to become entrapped, and in several instances I have seen these escape from the flower in the manner described above, bearing pollinia on their backs. The whole of the New Zealand species of *Pterostylis* are fertilized in the manner described above; and, according to the researches of the late Mr. Fitzgerald, it is also the manner employed in the Australian species.

PLATE 195. *Pterostylis Banksii*, drawn from specimens collected in the vicinity of Auckland.
Fig. 1, petal ($\times 2$); 2, lip and column ($\times 2$); 3, lip alone ($\times 2\frac{1}{2}$); 4, front view of column, the wings spread open ($\times 2$).



M. Smith del.
J. N Fitch lith

West, Newman imp.

PTEROSTYLIS FOLIATA, *Hook. f.*

PLATE 196.—PTEROSTYLIS FOLIATA.

FAMILY ORCHIDACEÆ.]

[GENUS PTEROSTYLIS, R. BR

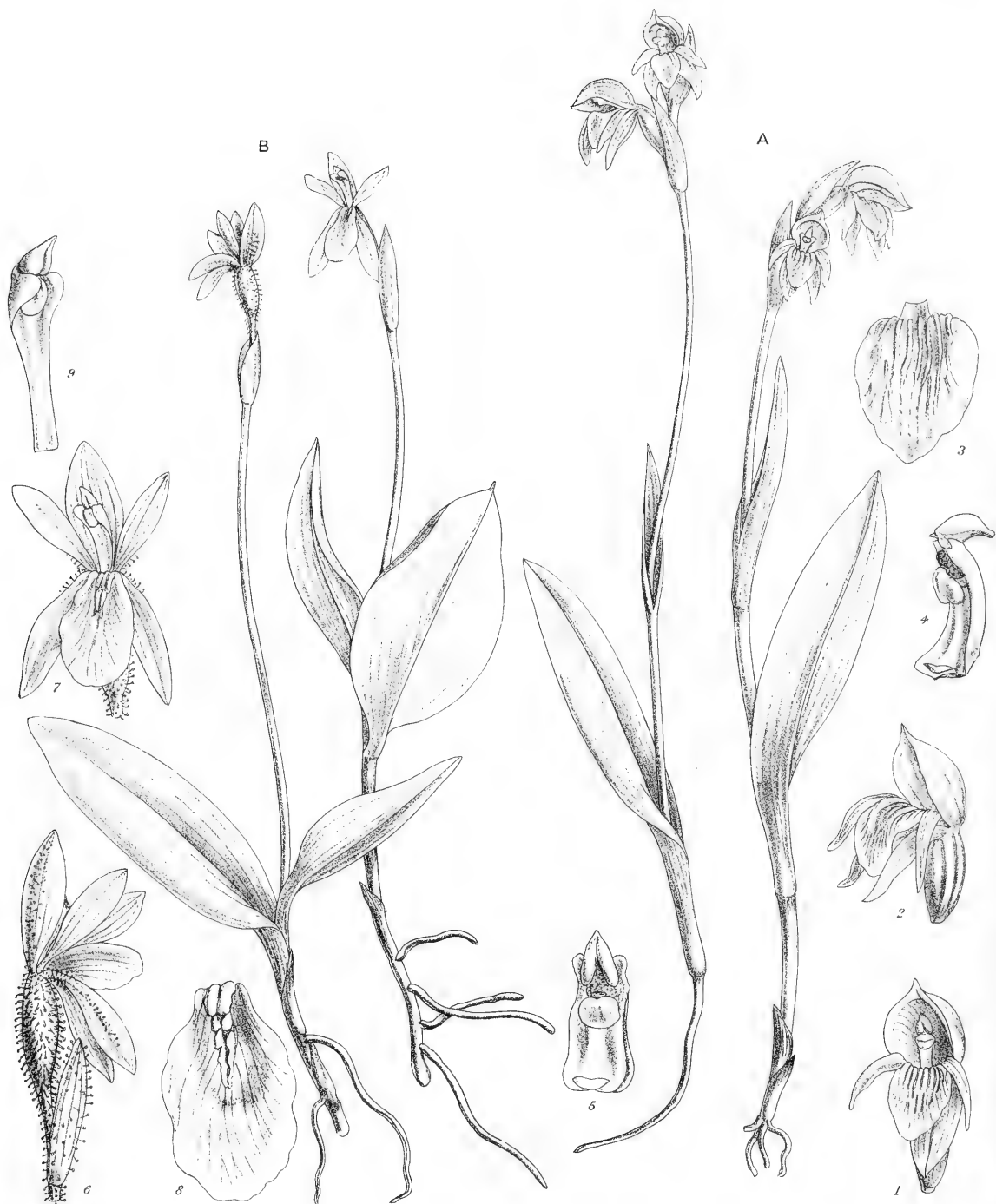
Pterostylis foliata, Hook. *J. Fl. Nov. Zcl.* i, 249; *Cheesem. Man. N.Z. Fl.* 681.

This is one of the numerous species the discovery of which is due to Mr. Colenso, who for many years was, to use the words of Sir J. D. Hooker, "the foremost New Zealand botanical explorer." He first collected it near Cape Palliser in 1845; and again in 1847 near the summit of the Ruahine Mountains, where it was associated with *Caladenia bifolia*, figured in the following plate. Subsequently he obtained it in several other localities on the eastern side of the North Island, where it has also been gathered by Mr. Tryon, Mr. Guthrie-Smith, and others. In 1863 Mr. Buchanan collected it on the uplands of eastern Otago, where, some years afterwards, it was also observed by Mr. Petrie. Mr. Kirk obtained it in a single station in Marlborough; but these two districts are the only known localities in the South Island. It is usually found in *Sphagnum* bogs, and it ranges from sea-level to 3,500 ft. elevation.

I have never had the good fortune to examine *Pterostylis foliata* in its native habitat, and am consequently greatly indebted to Mr. Guthrie-Smith for an ample supply of specimens in a fresh state collected by him on the margin of Lake Tutira, in northern Hawke's Bay, and from which the accompanying plate has been prepared. His specimens proved that the species varies greatly in size, some of them barely exceeding 4 in. in height, while others reached quite 18 in. When fresh the leaves are rather fleshy, and the reticulated veins are by no means obvious; but when dried the leaves become much thinner, and the veins decidedly conspicuous, as shown in the plate. The upper part of the peduncle, the ovary, and occasionally the lateral sepals, are more or less glandular-pubescent, a character that has not been mentioned in previous descriptions of the plant.

As a species *P. foliata* is allied to *P. micromega*, but differs in the stouter habit, larger more reticulate and usually rosulate radical leaves, in the cauline leaves being reduced to sheathing-bracts, and in the smaller flowers with much shorter points to the lateral sepals. *P. Oliveri* is separated by the same characters, and by the much larger conspicuously decurved flower. According to Dr. Schlechter, it is closely allied to the New Caledonian *P. Bureauviana*, a species with which I am not acquainted.

PLATE 196. *Pterostylis foliata*, drawn from specimens collected by Mr. Guthrie-Smith on the margin of Lake Tutira, Hawke's Bay. Fig. 1, flower ($\times 2$); 2, petal ($\times 2$); 3, lip ($\times 3$); 4 and 5, front and side view of column ($\times 3$).



M. Smith del.
J. N. Fitch lith.

A. *LYPERANTHUS ANTARCTICUS*, Hook. f. 1-5.
B. *CALADENIA BIFOLIA*, Hook. f. 6-9.

West, Newman imp.

PLATE 197.—LYPERANTHUS ANTARCTICUS AND
CALADENIA BIFOLIA.

FAMILY ORCHIDACEÆ.]

[GENERA LYPERANTHUS, R. BR.
CALADENIA, R. BR.

Lyperanthus antarcticus, Hook. *f. Fl. Antarct.* ii, 544; *Cheesem. Man. N.Z. Fl.* 687.

Caladenia bifolia, Hook. *f. Fl. Nov. Zel.* 247; *Cheesem. Man. N.Z. Fl.* 689.

Chiloglottis Traversii, F. Muell. *Veg. Chath. Is.* 51.

Chiloglottis bifolia, Schlechter in Engl. *Bot. Jahr.* band 45, p. 383.

Lyperanthus antarcticus was first discovered in the Auckland Islands in March, 1840, by Lieut. Le Guillon, a member of Admiral D'Urville's exploring expedition in the "Astrolabe" and "Zélée." In November of the same year Sir J. C. Ross, in the "Erebus" and "Terror," also visited the islands; and Sir J. D. Hooker, who accompanied the expedition, obtained imperfect specimens of the plant. All that Hooker could do in the first volume of the "Flora Antarctica" was to allude to the plant under the heading "dubii generis"; but an examination of Le Guillon's specimens enabled him to refer it to the genus *Lyperanthus*, and in the supplement to the second volume he consequently described it under the name it still bears. In 1863 it was collected by Sir James Hector and Mr. Buchanan in the interior of Otago. Since then it has been found to have a wide distribution in subalpine districts from the Tararua Range southwards to Stewart Island and the Auckland Islands. In New Zealand it is most common between 2,500 ft. and 4,000 ft. elevation, but it descends to sea-level in Stewart Island.

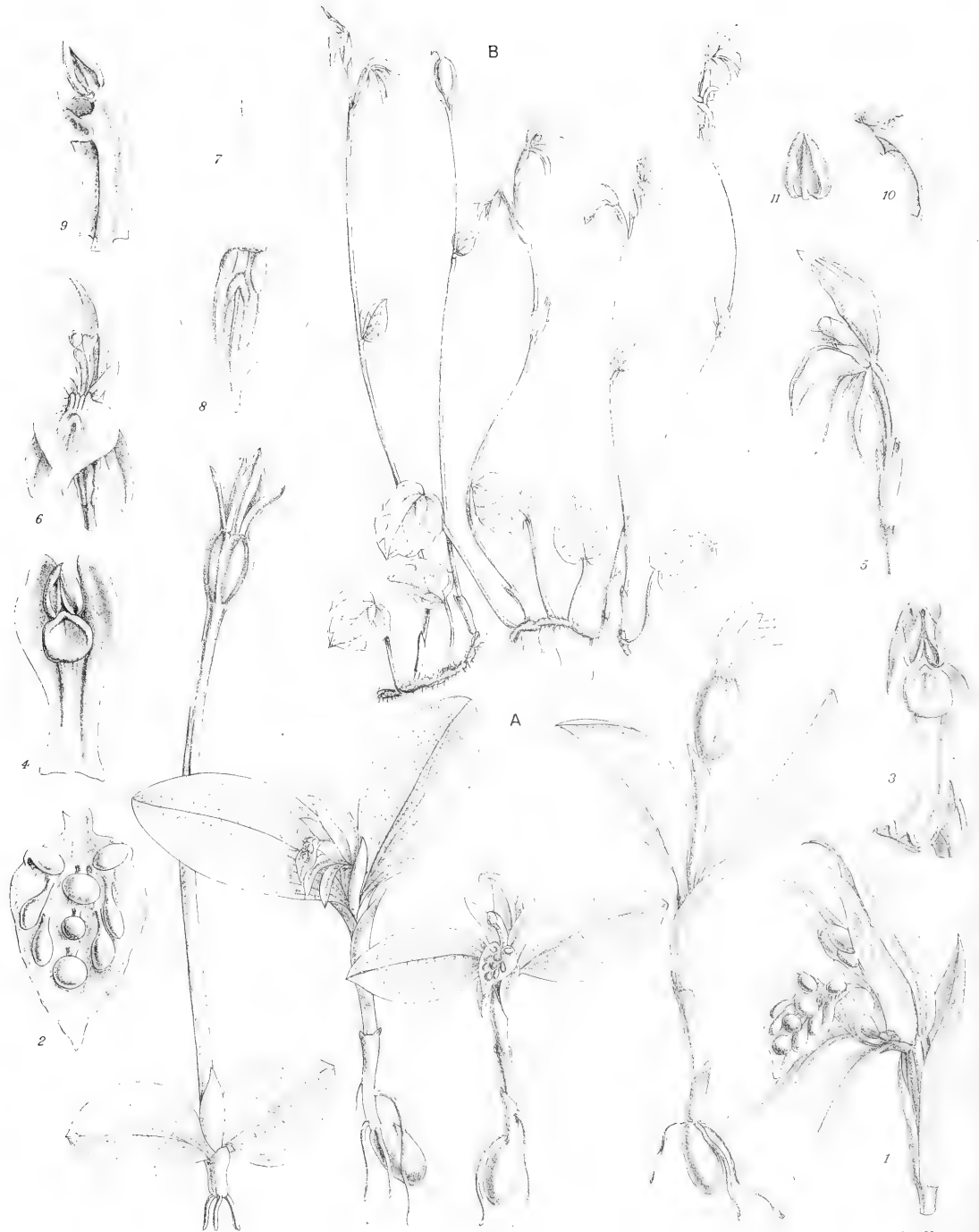
Lyperanthus antarcticus differs from the type of the genus in the upper sepal being much broader and more hooded, in the less spreading sepals and petals, and in the shorter and broader column, but the differences are not sufficient for generic distinction. According to Dr. Schlechter, the genus is confined to Australia and New Zealand, and is limited to four or five species. The New Caledonian plants formerly placed in the genus he now refers to *Megastylis* (see Engl. *Bot. Jahr.* vol. 45, 384).

Caladenia bifolia was also first collected on the Auckland Islands, imperfect specimens having been gathered thereon by Sir J. D. Hooker in 1840, and referred to in the "Flora Antarctica" under the heading "*Caladenia* No. 5." A few years later it was collected in Otago by Dr. Lyall, and on the Ruahine Range by Mr. Colenso. Subsequent exploration has proved that it is by no means uncommon in montane and subalpine districts from Rotorua and Taupo southwards to Stewart Island; it is also found in the Chatham Islands, Antipodes Island, and the Auckland Islands. It ascends as high as 4,500 ft. on the Nelson mountains, but descends to sea-level in the Chatham Islands and Stewart Island.

Caladenia bifolia is a somewhat anomalous member of the genus, its habit being precisely that of *Chiloglottis*, to which it has been referred by Baron Mueller, and more recently by Dr. Schlechter. But, as I have pointed out in the Manual, it wants the essential character of the wings of the column produced into two lobes behind the anther. In this respect the student should compare fig. 9 of the accompanying plate, showing the column of *Caladenia bifolia*, with fig. 4 of Plate 198, representing the column of *Chiloglottis cornuta*. On the whole, I am still of opinion that the species is best placed in *Caladenia*.

PLATE 197A. *Lyperanthus antarcticus*, drawn from specimens collected on the Auckland Islands by Mr. B. C. Aston. Fig. 1, front view of flower ($\times 2$); 2, side view of same ($\times 2$); 3, lip, showing the longitudinal lamellæ ($\times 4$); 4, side view of column ($\times 4$); 5, front view of column ($\times 4$).

PLATE 197B. *Caladenia bifolia*, drawn from specimens collected in the Mount Arthur Plateau, Nelson, at an altitude of 4,000 ft. Fig. 6, side view of flower ($\times 2$); 7, front view of flower ($\times 2$); 8, lip, showing the two lines of calli ($\times 4$); 9, column ($\times 4$).



M. Smith del
J. N. Fitch lith

A. *CHILOGLOTTIS CORNUTA*, Hook. f.
B. *TOWNSONIA DEFLEXA*, Cheesem.

West, Newman imp.

PLATE 198.—CHIOGLOTTIS CORNUTA AND TOWNSONIA DEFLEXA.

FAMILY ORCHIDACEÆ.]

[GENERA CHIOGLOTTIS, R. BR., AND
TOWNSONIA, CHEESEM.

Chiloglottis cornuta, Hook. f. *Fl. Antarct.* i, 69; *Cheesem. Man. N.Z. Fl.* 690.

Townsonia deflexa, *Cheesem. Man. N.Z. Fl.* 692.

Chiloglottis cornuta, like the two species figured in the previous plate, was first collected during the Antarctic expedition of Sir J. C. Ross, having been gathered on Campbell Island by Dr. Lyall, one of the naturalists attached to the expedition, in December, 1840. The first record of its occurrence in New Zealand proper was published by Mr. T. Kirk in 1870, his specimens having been obtained at Northcote, in the immediate vicinity of the City of Auckland, a locality where it still exists, although in fast-diminishing numbers. Almost immediately afterwards it was observed by several botanists in various portions of both the North and the South Islands, and at the present time it is known to extend through almost the whole length of the Dominion, from the North Cape district southwards to Stewart Island, the Chatham Islands, Antipodes Island, and the Auckland and Campbell Islands. In fact, there are few districts in the Dominion where it cannot be obtained, although it is rarely present in considerable numbers. It is usually found amongst humus in moist shaded places, and ranges from sea-level to quite 3,000 ft.

In Sir J. D. Hooker's original description of the species, published in the "Flora Antarctica" (vol. 1, p. 69), he makes the remark, "I am inclined to think that the glands on the disc of the labellum will be found to prove a variable character." This surmise has been fully verified, both as regards specimens from the islands to the south of New Zealand and from New Zealand proper. I find that the number of the glands varies from 6 to 12, and that the glands themselves are very inconstant in size, shape, and position. Facts like these show that such variable organs are of little value in the discrimination of species, unless they are accompanied by other and more stable differences.

In addition to *C. cornuta*, the genus *Chiloglottis* contains six or seven Australian species, one of which (*C. formicifera*, Fitzgerald) also extends to New Zealand.

The charming little plant figured in this plate under the name of *Townsonia deflexa* was discovered in the vicinity of Westport by Mr. W. Townson in the year 1904, and up to the present time has been gathered by no other botanist. As stated in the Manual, the generic name commemorates the services rendered to botanical science by Mr. Townson, who more than any other person has contributed to the elucidation of the flora of the southwestern portion of the Nelson Provincial District. Among the discoveries made by him are the following species illustrated in this work: *Aciphylla Townsoni* (Plate 62), *Dracophyllum Townsoni* (Plate 130), *Gentiana Townsoni* (Plate 139), *Veronica divergens* (Plate 148), and the plant now figured.

Mr. Townson informs me that *T. deflexa* occurs on the spurs of Mount Rochfort, Mount Frederic, and the Paparoa Mountains, which collectively form the coast ranges immediately to the north and south of the mouth of the Buller River. It ranges from 1,500 ft. to 2,000 ft. elevation, and is usually

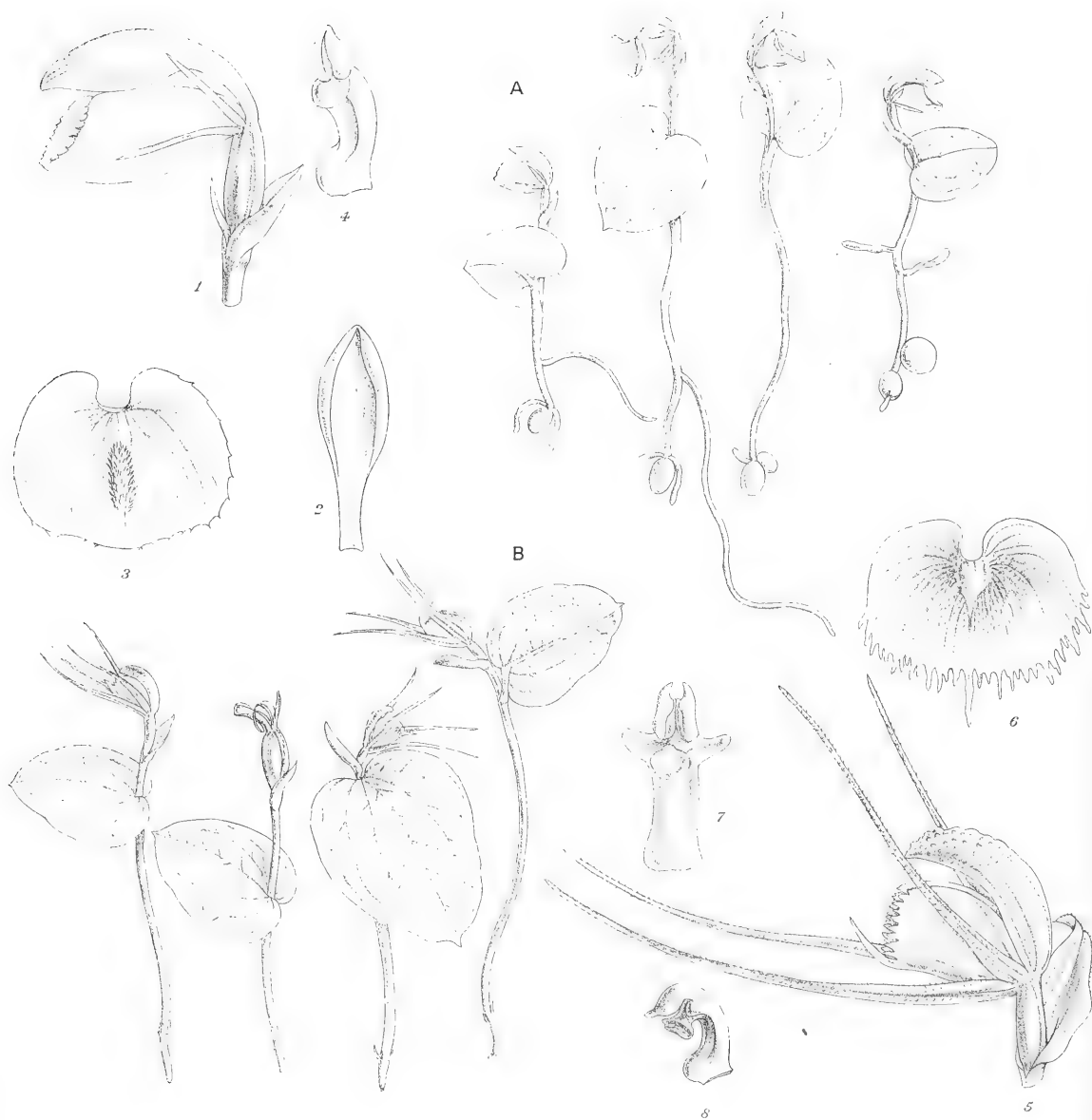
found on the mossy surface of rocks and logs under the shelter of *Leptospermum* and *Olearia Colensoi*, its colour harmonizing so closely with that of the moss that it is easily overlooked. It blooms in November and December, and when fully mature the flowers have a purplish tinge. It should be mentioned that the radical leaves are usually produced on special caudicles, and not at the base of the flowering-stem.

In the Manual I regarded *Townsonia* as a close ally of *Adenochilus*, relying principally on the structure of the column and the close similarity in habit. Dr. R. Schlechter, who has recently published some interesting notes on the genus (Fedde, Repertorium, ix, 249), suggests that it should be placed in the vicinity of *Acianthus*, with which it agrees in the smooth undivided lip, devoid of any projections or protuberances beyond two or three obscure ridges. He also points out that the Tasmanian *Acianthus viridis*, Hook. f., is very closely allied to *T. deflexa*, and must be placed in the same genus. *Townsonia* is therefore a genus of two species—one confined to the South Island of New Zealand, the other endemic in Tasmania. Dr. Schlechter also traces an affinity to the genus *Stigmatodactylus*, which has three species, found respectively in Japan, India, and Java.

Dr. Schlechter considers *Townsonia* to be an Antarctic type (*typisch antarktische*). But surely he uses the term in an entirely different sense from that understood by most New Zealand botanists. Genera like *Colobanthus*, *Acæna*, *Azorella*, *Nertera*, *Phyllachne*, *Rostkovia*, *Oreobolus*, &c., which have species in the extreme south of South America, New Zealand, Tasmania, and the circumpolar islands, may well be called Antarctic, and we are entitled to speculate on their probable previous existence on the Antarctic Continent. But in the case of *Townsonia*, whose nearest allies are the genera *Acianthus*, *Adenochilus*, and *Stigmatodactylus*, which have a purely Australian, Melanesian, and Malayan distribution, the term seems inappropriate. And especially is it so when we consider that the *Orchidaceæ* of New Zealand show absolutely no relationship to the few members of the family found in the extreme south of South America.

PLATE 198A. *Chiloglottis cornuta*, drawn from specimens collected at Maungatapere, Whangarei, by Mr. H. Carse. Fig. 1, side view of flower ($\times 3$); 2, lip, showing glands ($\times 5$); 3, front view of column ($\times 5$); 4, the same with the wings spread open ($\times 5$).

PLATE 198B. *Townsonia deflexa*, drawn from specimens collected in the vicinity of Westport by Mr. W. Townson. Fig. 5, side view of flower ($\times 3$); 6, front view of same ($\times 3$); 7, petal ($\times 5$); 8, lip (the ridges much too conspicuous) ($\times 5$); 9 and 10, front and side views of column ($\times 5$); 11, dehiscent anther ($\times 6$).



M. Smith del.
J. N. E. Rich.

West, Newman imp.

A. *CORYSANTHES MATTHEWSII* Cheesem. 1-4.
B. " *OBLONGA*, Hook f. 5-8.

PLATE 199.—*CORYSANTHES MATTHEWSII* AND *CORYSANTHES OBLONGA*.

FAMILY ORCHIDACEÆ.]

[GENUS *CORYSANTHES*, R. BR

Corysanthes Matthewsii, *Chcesem. in Trans. N.Z. Inst.* xxxi (1899), 351; *Man. N.Z. Fl.* 693.

Corysanthes oblonga, *Hook. J. Handb. N.Z. Fl.* 694; *Chcesem. Man. N.Z. Fl.* 694.

Corysanthes Matthewsii is one of the discoveries of the late Mr. R. H. Matthews, of Kaitaia, who during a residence of many years in the extreme north of the Dominion paid special attention to the *Orchidaceæ*, and who added several species to the flora. *C. Matthewsii* was first gathered in the vicinity of Kaitaia in 1898; but it has since been found by Mr. H. Carse at Fairburn, between Kaitaia and Mongonui, where it is not uncommon on shaded mossy slopes. It has also been collected by Mr. A. Thompson at Aponga, inland from Whangarei. No doubt it will be found in other localities, for it is not easy to exhaust the orchid-flora of any district, particularly as regards the smaller terrestrial species. Their period of bloom, during which alone they can be positively recognized, is but short; and their habitats are often of a recluse and sequestered nature.

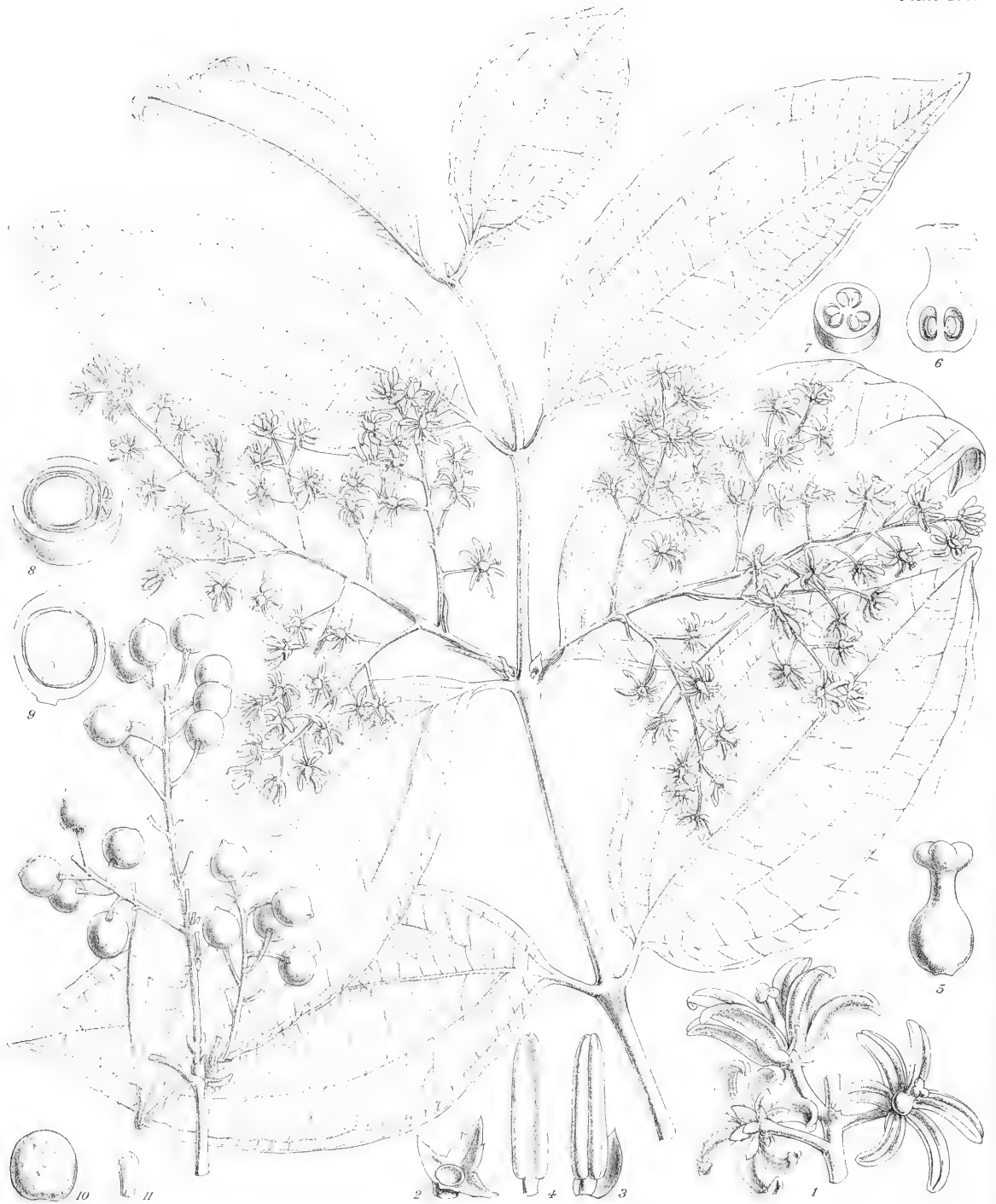
C. Matthewsii is much more closely allied to *C. oblonga* than any other species, but can be at once distinguished by the rather larger flowers; by the much smaller lateral sepals and petals, which are never more than half the length of the upper sepal, whereas in *C. oblonga* they are more than twice as long; and by the margin of the lip being either quite smooth or very obscurely denticulated, while the disc is furnished with a thickened patch of close-set deflexed hairs. *C. Carsei*, a species which I have lately described from the same district, is also allied; but its flower is longer and often conspicuously deflexed, the dorsal sepal is narrower, and the lip has a curious projecting lamina at its tip.

According to Sir J. D. Hooker, *Corysanthes oblonga* was originally discovered by Allan Cunningham; but, if so, it is curious that it was not included in his "Precursor." It was, however, collected at nearly the same time by Mr. Edgerley in some locality in the North Island, by Mr. Colenso at the Bay of Islands, and by Colonel Haultain in the vicinity of Auckland. Subsequent research has proved that it extends throughout the whole length of the Dominion, from the North Cape district southwards to Stewart Island and the Auckland Islands. It is usually found on moist mossy declivities in shaded forests, and although common at sea-level it ascends as high as 2,500 ft. I have already pointed out the differences between it and its nearest ally, *C. Matthewsii*.

The genus *Corysanthes* contains about thirty-five species. It attains its southern limit in New Zealand, where eight species are now known. It stretches northwards through Australia to New Guinea, the Himalaya Mountains, and the Philippine Islands; and eastwards as far as Tahiti. It has, therefore, the characteristic distribution of most of the genera of the New Zealand *Orchidaceæ*.

PLATE 199A. *Corysanthes Matthewsii*, drawn from specimens collected by Mr. R. H. Matthews in the vicinity of Kaitaia, Mongonui County. Fig. 1, side view of flower ($\times 4$); 2, dorsal sepal ($\times 4$); 3, lip spread open ($\times 4$); 4, column ($\times 6$).

PLATE 199B. *Corysanthes oblonga*, drawn from specimens collected by Mr. R. H. Matthews in the vicinity of Kaitaia. Fig. 5, side view of flower ($\times 4$); 6, lip spread open ($\times 4$); 7 front view of column ($\times 6$); 8, side view of same ($\times 6$).



West, Newman imp.

RHIPOGONUM SCANDENS, Forst.

PLATE 200.—RHIPOGONUM SCANDENS.

(THE SUPPLEJACK.)

FAMILY LILIACEÆ.]

[GENUS RHIPOGONUM, FORST.

Rhipogonum scandens, Forst. Char. Gen. 50; Cheesem. Man. N.Z. Fl. 700.

Few plants are better known to the frequenter of the lowland forests of New Zealand than the subject of this plate, the kareao of the Maoris, and the supplejack of the European colonists. Its long climbing stems arrest the progress of the traveller at every turn, binding one tree to another, and presenting a bewildering tangle always difficult to penetrate, and sometimes almost impossible. The first description ever framed of the plant—that of Dr. Solander, no doubt written with a vivid recollection of a contest with it—begins so accurately and yet so quaintly that I may be excused for quoting the opening sentence here: “Frutex ambulatoribus sylvarum molestissimus illisque ubique obstands.”

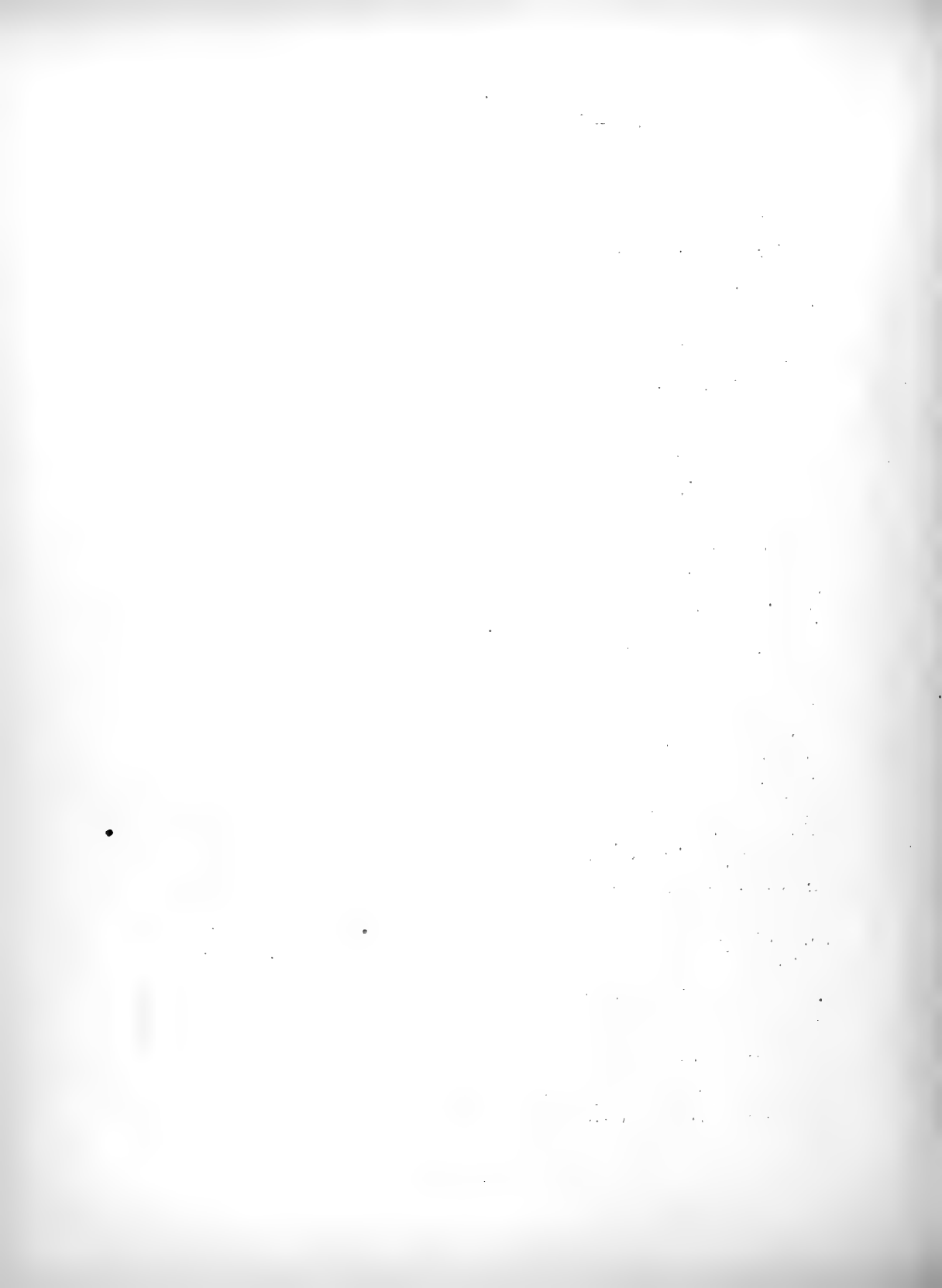
As hinted above, *Rhipogonum scandens* was originally discovered during Cook's first voyage to New Zealand in the year 1769. It was collected by the naturalists to the expedition at Tolaga Bay, Mercury Bay, the Thames River, and Queen Charlotte Sound. It was fully described, and an excellent figure prepared of it, neither of which, however, was actually published. It was again gathered by the two Forsters during Cook's second voyage, and was published by them in their “Characteres Generum Plantarum” under the name which it still bears. Almost every botanical explorer since then has collected or observed it, and it is now known to range from the North Cape southwards to Stewart Island and the Chatham Islands. In the northern portion of the Dominion—that is, to the north of the Upper Waikato—its distribution is pretty general, and it ascends as high as 2,000 ft.; but it is absent from the central volcanic plateau and the higher mountains of the North Island, and in the South Island is mainly found in lowland forests not far from the sea.

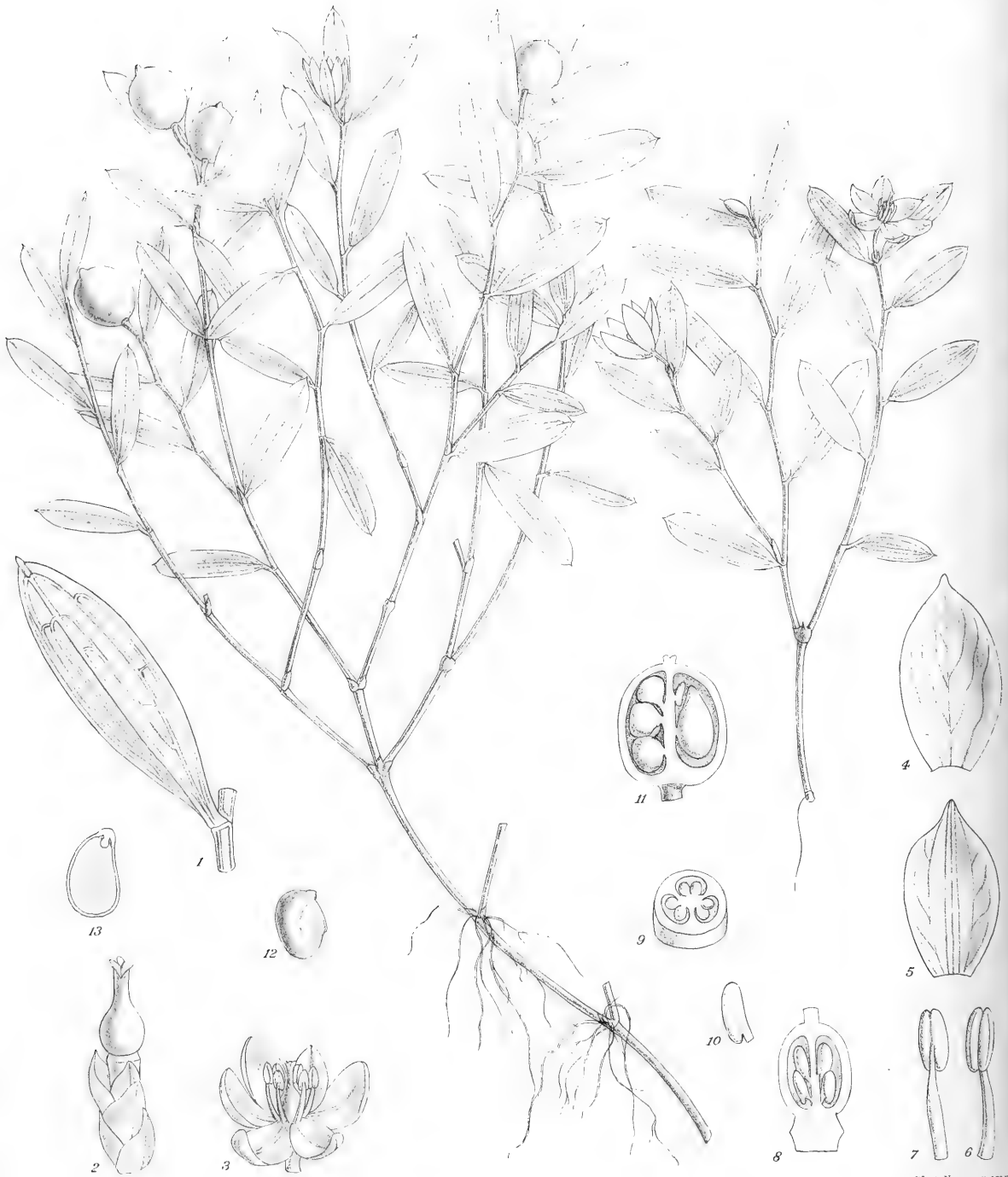
The mode of growth of *Rhipogonum scandens* presents many peculiarities worthy of attentive study. A. Richard, in his “Flore de la Nouvelle Zélande,” quotes some excellent remarks from Forster's manuscripts, proving that the main facts of its life-history were known to him. He mentions the creeping rhizome, and the tubercular mass, “as large as a fowl's egg,” from which the stems spring. He clearly describes the knotted stems, mentioning the smooth interspaces between the knots, and he also describes with considerable detail the remarkable and early deciduous cauline leaves, so very different in shape from the foliage leaves, which are usually confined to the upper branches. Some valuable remarks on the behaviour of *Rhipogonum* as a climbing plant will be found in Dr. Cockayne's “Report on the Waipoua Kauri Forest” (p. 24).

The long tough and durable elastic stems have been applied to a variety of purposes, as the manufacture of baskets, hurdles, fences, &c. They were also used by the Maoris in constructing rope ladders, with which to ascend cliffs, or the walls of their pas or fortifications. A decoction of the root was used in the place of sarsaparilla by the early colonists, and it was also employed medicinally by the Maoris.

The genus *Rhipogonum* contains five species in all. Four of these are confined to eastern Australia; the remaining one, the subject of this plate, is endemic in New Zealand.

PLATE 200. *Rhipogonum scandens*, drawn from specimens collected on the Waitakerei Ranges, near Auckland. Fig. 1, portion of inflorescence ($\times 3$); 2, bract and two bracteoles ($\times 6$); 3, perianth-segment and stamen ($\times 5$); 4, back of stamen ($\times 5$); 5, pistil ($\times 10$); 6, longitudinal section of same ($\times 10$); 7, transverse section of same ($\times 10$); 8, transverse section of fruit ($\times 2\frac{1}{2}$); 9, longitudinal section of fruit ($\times 2\frac{1}{2}$); 10, seed ($\times 3$); 11, embryo (enlarged).





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

LUZURIAGA MARGINATA, Benth & Hook. f.

PLATE 201.—LUZURIAGA MARGINATA.

FAMILY LILIACEÆ.]

[GENUS LUZURIAGA, RUIZ & PAV.

Luzuriaga marginata, *Benth. and Hook. f. Gen. Plant.* iii, 768.

Callixene parviflora, *Hook. f. in Hook. Ic. Plant.* t. 632; *Handb. N.Z. Fl.* 281.

Enargea marginata, *Banks and Sol. ex Gaertn. Fruct.* i, 283, t. 59; *Cheesem. Man. N.Z. Fl.* 704.

According to Sir J. D. Hooker (*Fl. Nov. Zel.* i, 254), this charming little plant was first discovered in New Zealand by either Forster or Menzies, although it is not recorded in any of the early publications on the botany of the Dominion. Be that as it may, it was not again seen until December, 1841, when it was gathered by Mr. Colenso "at the foot of large trees in the beech forest, on the ascent of the mountains from Lake Waikare." A few years later it was collected by Mr. Bidwill on the Nelson mountains, and by Dr. Lyall in some locality in the south of the South Island. Further explorations have shown that it attains its northern limit on Moehau Mountain (Cape Colville), from whence it stretches southwards, on the summits of the higher peaks only, to the East Cape and the central volcanic plateau. From thence it is of common occurrence in wooded upland districts as far south as Stewart Island. Its altitudinal range is from sea-level to 3,500 ft.

In the Manual I followed Baron Mueller in adopting the generic term *Enargea* for the plant now figured and its immediate allies; my reasons being that *Enargea*, having been published in 1788 by Gaertner from Banks and Solander's MSS, was clearly entitled to precedence over *Callixene*, which did not appear until the following year, and over *Luzuriaga*, which was not published until 1802. But since then the Vienna Conference of 1905 has definitely ruled that *Luzuriaga* is the name to be employed. As it is clearly desirable, for the sake of uniformity of nomenclature, that the decisions of the Conference should be loyally accepted, I have adopted that name in this work.

Luzuriaga contains three or possibly four species. Two of these are found in Chile; the third in Fuegia and New Zealand. It should be mentioned, however, that the Fuegian plant, to which the name *marginata* properly belongs, differs from that found in New Zealand in the much larger flowers, which are said to be nearly double the size. It was mainly on account of this character that Hooker described our plant as a distinct species, under the name of *Callixene parviflora*. In the "Genera Plantarum," however, he gave his assent to the union of the two plants, and it appears best to follow that course until a careful comparison can be made.

PLATE 201. *Luzuriaga marginata*, drawn from specimens collected on Dun Mountain, Nelson, by Mr. F. G. Gibbs. Fig. 1, leaf, showing venation ($\times 2\frac{1}{2}$); 2, bracts and pistil ($\times 3$); 3, flower ($\times 1\frac{1}{2}$); 4, outer perianth-segment ($\times 4\frac{1}{2}$); 5, inner perianth-segment ($\times 4\frac{1}{2}$); 6 and 7, front and back view of anthers ($\times 3$); 8, longitudinal section of ovary ($\times 5$); 9, vertical section of same ($\times 5$); 10, ovule (enlarged); 11, section of fruit ($\times 2$); 12, seed ($\times 4$); 13, section of seed ($\times 4$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

BULBINELLA HOOKERI, *Benth & Hook. f.*

PLATE 202.—*BULBINELLA* *HOOKERI*.

FAMILY LILIACEÆ.]

[GENUS *BULBINELLA*, KUNTH.

Bulbinella Hookeri, *Benth. and Hook. f. Gen. Plant.* iii, 784; *Cheesem. Man. N.Z. Fl.* 718.

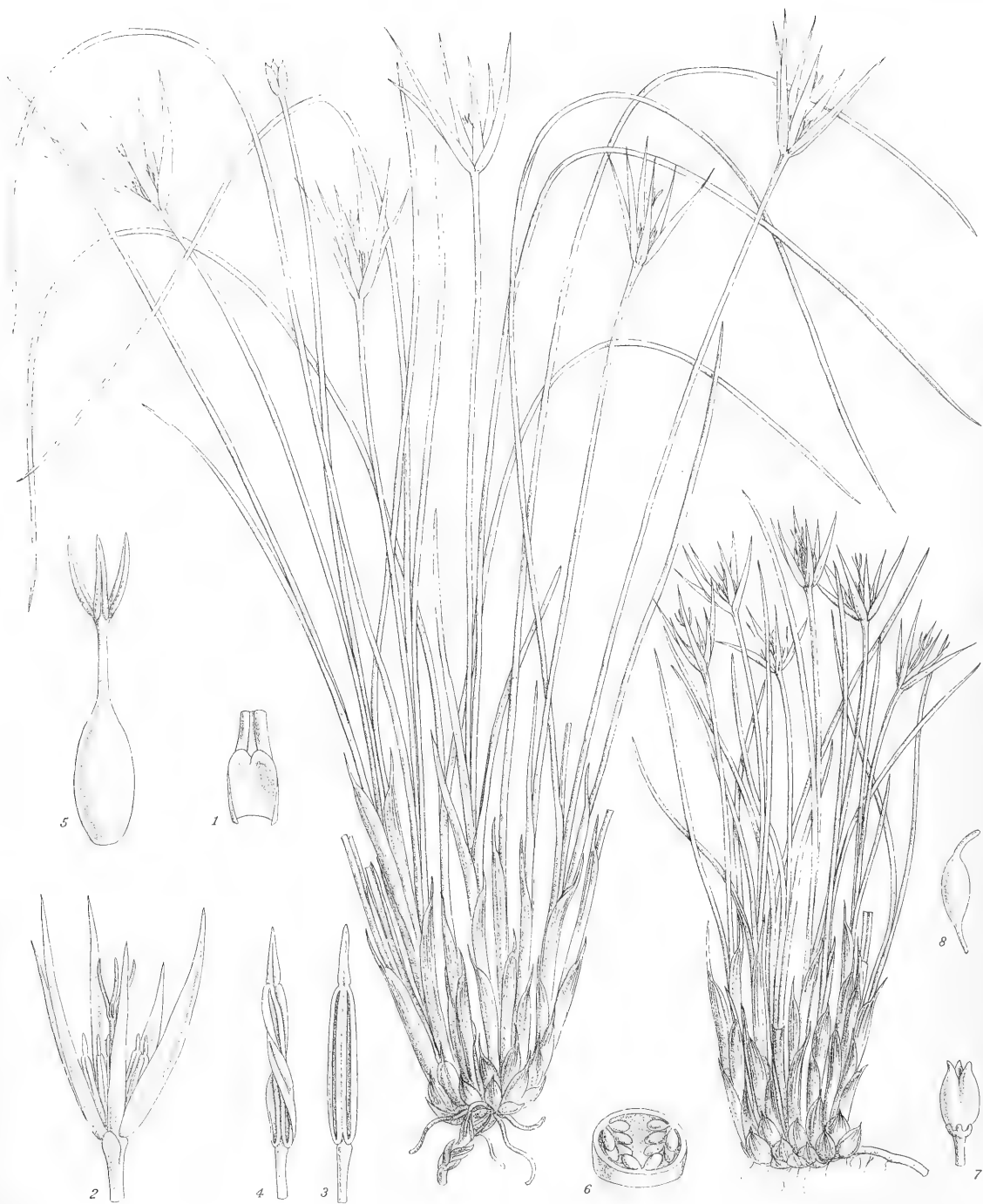
Although the species now figured is one of the most widely distributed subalpine plants in the Dominion, in some localities forming a large percentage of the vegetation, it was not gathered by any of the early investigators of the New Zealand flora. So far as I can ascertain, it was not observed until 1847, when it was collected by Mr. Colenso during his second journey to the Ruahine Range. About the same time, or shortly afterwards, it was gathered by Mr. Bidwill in the Wairau Valley, Nelson; and a little later by Dr. Lyall in the southern portion of the South Island. It attains its northern limit on Mount Egmont and in the Taupo district, from whence it stretches southwards as far as Stewart Island. In the North Island I am not aware of any locality at a lower elevation than 2,000 ft.; but in the southern portion of the South Island it comes down to sea-level, or nearly so.

Bulbinella Hookeri is most plentiful in moist peaty soil, or in peaty swamps where not too wet. But it is by no means confined to such situations, and often occurs in abundance on comparatively dry slopes or on open saddles. Of late years it has increased enormously in almost the whole of the open subalpine country along the chain of the Southern Alps, mainly through its power of resisting fire, and from the fact that as a rule it is distasteful to stock. As far back as 1878, the date of my first visit to the Nelson mountains, I was informed by the late Mr. J. Kerr that its increase in the Wairau Valley was most noteworthy; and in subsequent visits I was able to confirm the statement and to extend it to other districts. Similar observations have been recorded from other parts of the South Island; and Mr. R. M. Laing has proved that the allied *B. Rossii* is increasing its numbers in Campbell Island in a very similar manner.

Bulbinella Hookeri is an erect perennial herb with a rosette of green or glaucous-green leaves springing from the top of the bundle of fleshy fibres which constitute the root. From the centre of the leaves rises the scape-like peduncle or flowering-stem, quite bare of cauline leaves, and ending in a raceme of more or less crowded bright-yellow flowers. It varies greatly in size: on the Mount Arthur Plateau, Nelson, I have seen specimens barely 4 in. high growing within a few yards of others attaining quite 2 ft. or even more. The proportionate width of the leaves, the length of the racemes, and the number of flowers are also highly variable. Up to the present time, however, I have been unable to sort these forms into systematic varieties distinguished by stable characters.

The genus *Bulbinella*, as characterized in the "Genera Plantarum" and "Die Natürlichen Pflanzenfamilien," consists of twelve or thirteen species, all natives of the Cape of Good Hope except the two species found in New Zealand. It is often quoted as evidencing a relationship between the New Zealand and South African floras; but the New Zealand species differ greatly in habit and other characters from the South African; and it must be borne in mind that *Bulbinella* and other genera are separated from the widespread genus *Anthericum* more by arbitrary characters than by structural differences of importance.

PLATE 202. *Bulbinella Hookeri*, drawn from specimens collected on Jollie's Pass, Hanmer, at an elevation of 3,000 ft. Figs. 1 and 2, side and upper view of flower ($\times 3$); 3 and 4, front and back view of anthers ($\times 6$); 5, ovary and style ($\times 5$); 6, transverse section of ovary ($\times 7$); 7, ripe capsule ($\times 3$); 8, capsule dehiscent ($\times 3$); 9, seed (enlarged); 10, longitudinal section of seed (enlarged).



M. Smith del.
J. N. Fitch lith

West, Newman imp.

ROSTKOVIA GRACILIS, Hook. f.

PLATE 203.—ROSTKOVIA GRACILIS.

FAMILY JUNCACEÆ.]

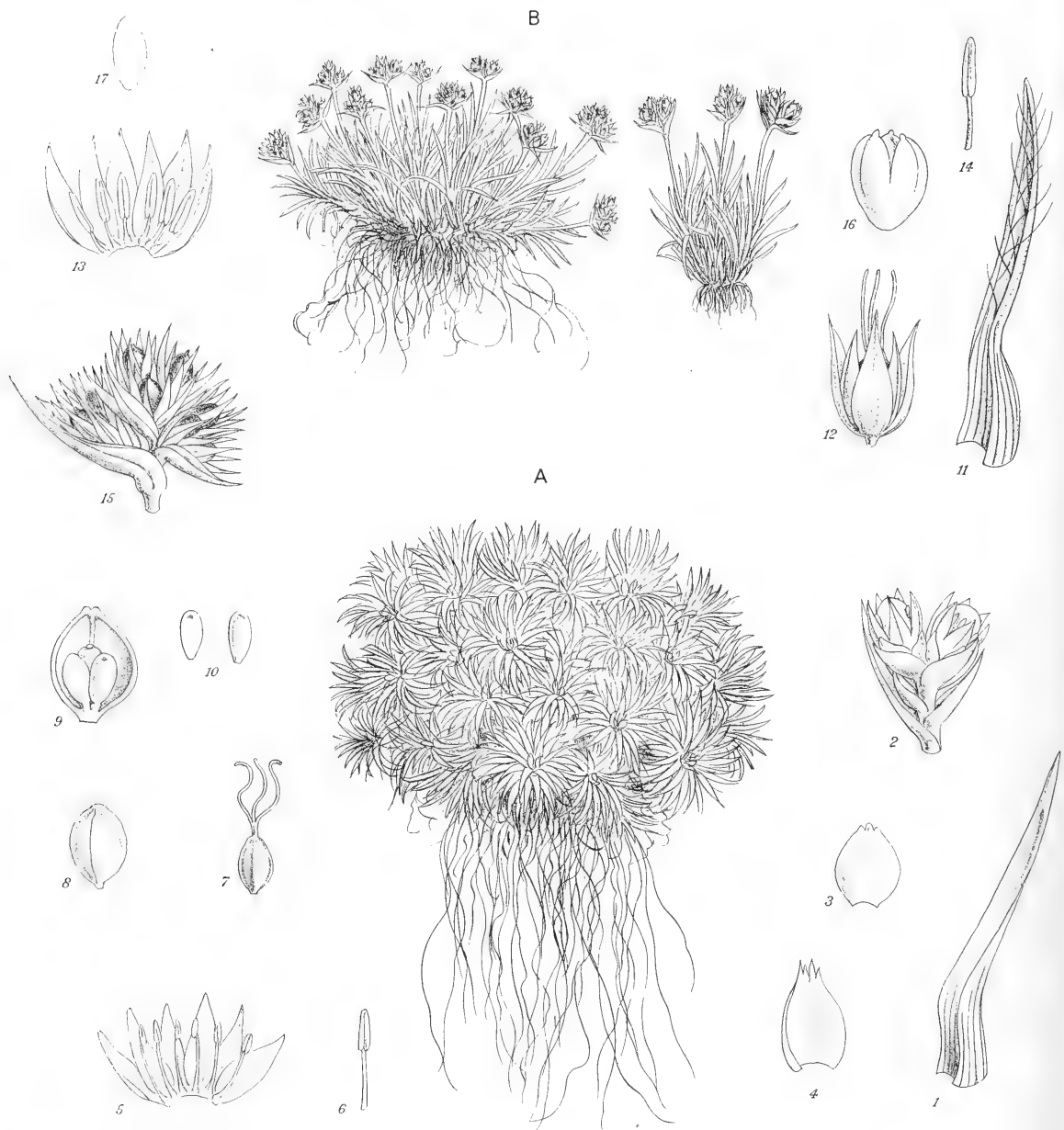
[GENUS ROSTKOVIA. DESV.]

Rostkovia gracilis, Hook. f. *Fl. Antarct.* i, 83, t. 47; *Cheesem. Man. N.Z. Fl.* 722.

Rostkovia gracilis was first collected by Sir J. D. Hooker on the Auckland and Campbell Islands towards the close of the year 1840, during the short visit made to the islands by Sir J. C. Ross in the Antarctic exploring-vessels "Erebus" and "Terror." On his return to England Hooker published the species in his monumental "Flora Antarctica," giving a full description and excellent plate. He remarks that it was found "amongst rocks and also in marshy places; common at an elevation of 800 ft. to 1,200 ft." Subsequent visitors to the group have also found it to be plentiful. The first botanist to observe it in New Zealand was Sir Julius von Haast, who in 1865 collected it on the slopes above Browning's Pass, at the head of the Rakaia Valley. It is now known to be generally distributed in alpine localities in the South Island, from the Mount Arthur Plateau, Nelson, to Foveaux Strait. It does not seem to have been recorded from Stewart Island. The late Mr. Buchanan separated the New Zealand plant from that found in the Auckland and Campbell Islands in the belief that the latter always had the leaves solitary and two or three times longer than the stems. But in point of fact specimens from both localities are variable in the number and length of the leaves.

Taking the genus *Rostkovia* in the sense of the "Genera Plantarum," it contains four species. Of these, three are found in the southernmost portions of South America, one of them also extending to the Falkland Islands, South Georgia, and the Auckland and Campbell Islands. The remaining species, which is the one figured in this work, is confined to the New Zealand region. *Rostkovia* is thus a typical Antarctic genus, if it is allowable to use the term for those genera which exist on several of the land-masses which most nearly approach the Antarctic Continent, but of whose previous existence thereon we have no proof whatever.

PLATE 203. *Rostkovia gracilis*, drawn from specimens collected on Mount Torlesse, Canterbury, at an altitude of 4,000 ft. Fig. 1, ligule of leaf ($\times 2$); 2, flower ($\times 2$); 3 and 4, anthers ($\times 6$); 5, pistil ($\times 6$); 6, transverse section of ovary ($\times 6$); 7, capsule ($\times 2$); 8, seed (enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

A. *LUZULA COLENSOI*, Hook. f.
B. *LUZULA CHEESEMANII*, Buchen.

PLATE 204.—*LUZULA COLENSOI* AND *LUZULA*
CHEESEMANII.

FAMILY JUNCACEÆ.]

[GENUS *LUZULA*, D.C.

Luzula Colensoi, Hook. f. *Handb. N.Z. Fl.* 293; *Cheesem. Man. N.Z. Fl.* 734.

Luzula Cheesemanii, Buchen. *Monog. Junc.* 146; *Cheesem. Man. N.Z. Fl.* 735.

As its name denotes, *Luzula Colensoi* was one of the many discoveries of Mr. Colenso, and was gathered by him on the summit of the Ruahine Range in February, 1847, on the occasion of his first successful attempt to cross the range. In his interesting "Visits to the Ruahine Mountain Range" (p. 60-61) he mentions a number of plants forming "isolated patches, tufts, or hemispherical-shaped cushions closely compacted together," and includes in the list "a Juncaceous plant, scarcely an inch high, *Luzula Colensoi*, which also assumes dumpy hemispherical tufts or cushions." There is no record of the species being met with again until 1878, when I gathered it on the summit of Gordon's Nob, in the Nelson Provincial District; and in successive years in several other localities in the Nelson and Canterbury mountains. More recently it has been collected by various botanists in numerous localities in both the North and South Islands. It attains its northern limit, so far as I am aware, on Mount Egmont and on Tongariro Mountain, where it is unusually plentiful; and stretches southwards as far as the Longwood Range, in the south of Otago. It is a high alpine, and I have not myself seen it much below 4,000 ft. altitude, while it ascends to considerably above 6,000 ft.

As a species *Luzula Colensoi* is readily distinguished by its small size and almost glabrous habit; by its compact cushion-shaped mode of growth; by the remarkably short stems, the flowers being sunk amongst the leaves; and by the pale-coloured inflorescence.

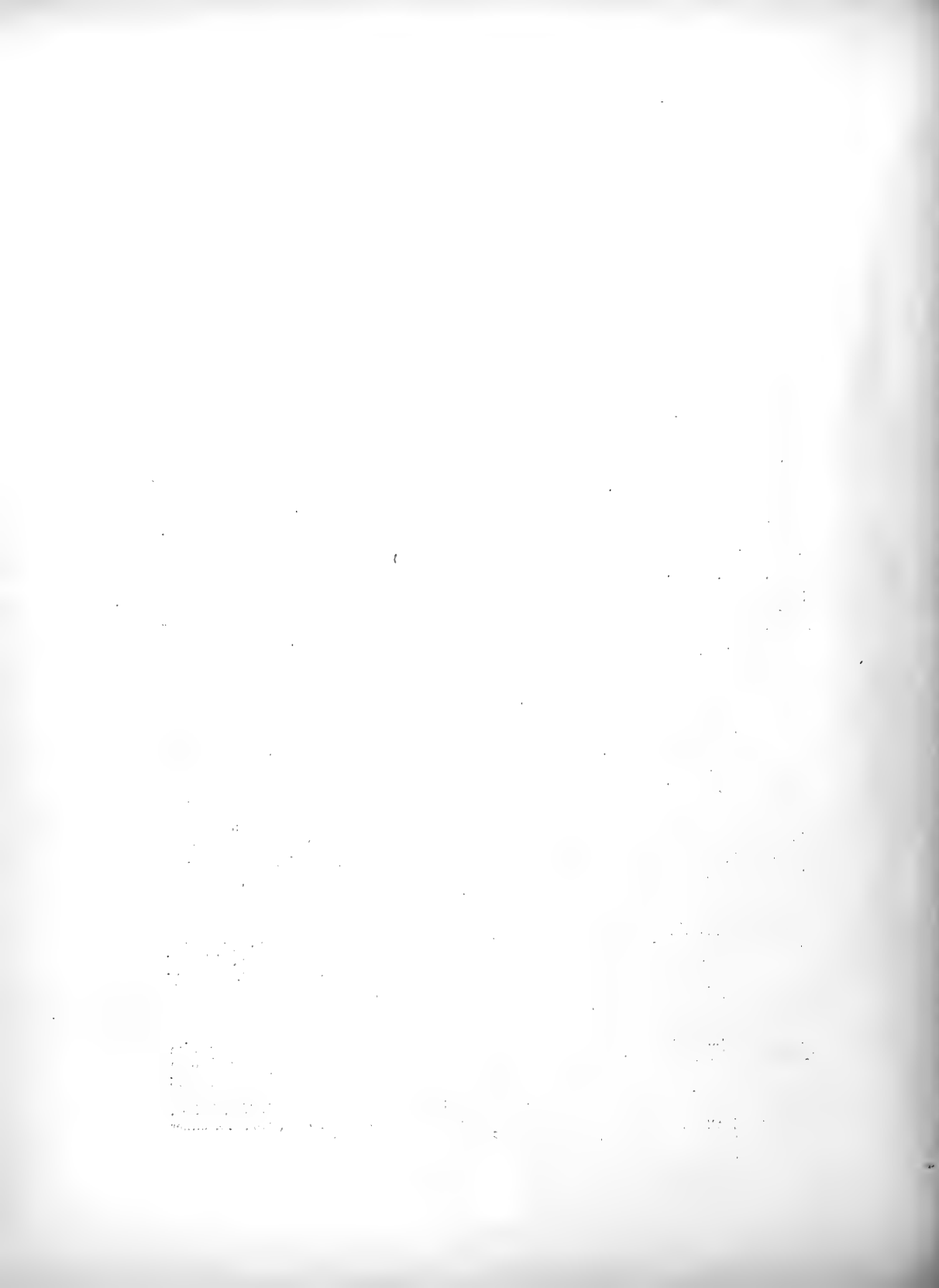
The pretty little plant to which the name of *Luzula Cheesemanii* has been applied by Dr. Buchenau was first collected by myself on the summit of Gordon's Nob, Nelson, in the year 1878. Two years later Mr. J. D. Enys and myself gathered it on the mountains near the source of the Broken River, Canterbury, at an altitude of nearly 6,000 ft. It has since been collected by Mr. Kirk on Mount Mouatt (Marlborough); on Mount Torlesse by Dr. Diels; and on the Craigieburn Mountains (Canterbury) and on Mount Kyebrun and the Dunstan Mountains (Otago) by Mr. Petrie. Its altitudinal range is very similar to that of *L. Colensoi*.

L. Cheesemanii is very similar in size, habit, and appearance to *L. pumila*, but differs in the more compound inflorescence and in the broader perianth-segments, which have a narrow dark-chestnut stripe down the middle, and very broad silvery-white margins. In *L. pumila* the chestnut stripe is broad and distinct, and the white margins are either absent or very obscurely represented. From *L. micrantha* and *L. Colensoi* it is at once removed by the flowering-stems being always longer than the leaves.

The genus *Luzula* contains about sixty species, the great majority of which are confined to the Northern Hemisphere. The seven New Zealand species (or rather eight, for Buchenau's *L. racemosa* var. *ulophylla* is doubtless distinct) are all very closely connected with the cosmopolitan *L. campestris*. With the exception of *L. campestris* and *L. racemosa*, the whole of them are confined to New Zealand.

PLATE 204A. *Luzula Colensoi*, drawn from specimens gathered on Mount Egmont, at an elevation of 6,000 ft. Fig. 1, leaf ($\times 5$); 2, inflorescence ($\times 5$); 3 and 4, bracts (enlarged); 5, flower laid open ($\times 8$); 6, anther ($\times 10$); 7, ovary and styles ($\times 7$); 8, capsule ($\times 7$); 9, section of capsule ($\times 10$); 10, seeds (enlarged).

PLATE 204B. *Luzula Cheesemanii*, drawn from specimens gathered on Gordon's Nob, Nelson, at an altitude of 5,000 ft. Fig. 11, leaf ($\times 4$); 12, flower ($\times 8$); 13, flower laid open ($\times 8$); 14, anther ($\times 10$); 15, fruiting inflorescence ($\times 5$); 16, capsule ($\times 8$); 17, seed (enlarged).





M. Smith del.
J.N. Fitch lith.

West, Newman imp.

SPARGANIUM ANTIPODUM, Graebner.

PLATE 205.—SPARGANIUM ANTIPODUM.

FAMILY SPARGANIACEÆ.]

[GENUS SPARGANIUM, LINN.]

Sparganium antipodum, Graebner in *Allg. Bot. Zeitschr.* iv (1899), 33; *Cheesem. Man. N.Z.* Fl. 744.

Mr. J. C. Bidwill appears to have been the first to collect *Sparganium antipodum* in New Zealand, but I am unaware of the exact locality. Mr. Colenso and other early botanists also obtained it; so that Sir J. D. Hooker, in the "Flora Novæ Zelandiæ," spoke of it as being common in the North Island in watery places. This, however, requires some qualification, for south of the East Cape and Taranaki it is rarely seen except in lowland districts not far from the sea. In the South Island it has been recorded from Picton by Mr. Rutland, from the Westport district by Mr. Townson, and I have seen a specimen said to have been collected in North Canterbury by Dr. Gaze.

S. antipodum extends to Australia, where it ranges from Queensland to Victoria, and is the only species of the genus found in the Southern Hemisphere. In the "Flora," and again in the "Handbook," Sir J. D. Hooker referred it to the northern *S. simplex*. Mr. Bentham, in the "Flora Australiensis" (vol. vii, p. 161) says that "this plant has the simple inflorescence, foliage, and habit of the erect varieties of *S. simplex*, but has not the narrow acuminate fusiform fruit of that species. The fruit is more like that of *S. ramosum*, but smaller." Mr. Bentham therefore revived Robert Brown's name of *S. angustifolium*, in spite of the fact that it had already been applied to an American species. In 1900 Dr. Graebner, in his monograph of the genus published in "Das Pflanzenreich" (heft 2), proposed the new name of *S. antipodum*. This I accepted in the Manual; but there can be little doubt that Morong's name of *S. subglobosum*, applied to a plant collected by Wilkes's Expedition at the Bay of Islands, is the one which will ultimately have to be accepted, as it has eleven years' priority of date.

According to Dr. Graebner, there are fifteen well-ascertained species of the genus; all of them, except *S. antipodum*, confined to the temperate or frigid zones of the Northern Hemisphere. Most of the species are very variable, and are divided by Graebner into numerous subspecies, varieties, and minor divisions, mainly characterized by slight differences in habit, shape of the leaf, shape and size of the fruit, &c. The occurrence of a species of the genus in Australia and New Zealand so far removed from all its allies is a very remarkable problem in plant distribution.

PLATE 205. *Sparganium antipodum*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, section of inflorescence ($\times 3$); 2 and 3, perianth-segments ($\times 10$); 4, anther ($\times 8$); 5, cross-section of anther (enlarged); 6, section of female inflorescence ($\times 3$); 7 and 8, perianth-segments from female flower ($\times 10$); 9, section of ovary (enlarged); 10, ripe fruit ($\times 8$); 11, section of same ($\times 8$); 12, section of seed (enlarged); 13, embryo (enlarged).





M. Smith del.
J.N. Pritch lith.

West, Newman imp.

POTAMOGETON CHEESEMANII, A. Bennett.

PLATE 206.—POTAMOGETON CHEESEMANII.

FAMILY NAIADACEÆ.]

[GENUS POTAMOGETON, LINN.]

Potamogeton Cheesemanii, A. Bennett in *Journ. Bot.* xxi (1883), 66; *Cheesem. Man. N.Z. Fl.* 749.

Allan Cunningham was the first to collect this species in New Zealand, for although he referred his specimens to the widespread *P. natans*, the description of the leaves given in the "Precursor," where he says "foliis natantibus petiolatis ellipticis basi apiceque rotundatis," agrees with *P. Cheesemanii*, and does not suit *P. natans*, which has acute or subacute leaves, often more or less subcordate at the base. His specimens were gathered "in stagnant waters near the missionary station on the Kerikeri River, Bay of Islands." It was also gathered in early times by Mr. Colenso and Dr. Sinclair, and probably by other botanists; but as Sir J. D. Hooker, both in the "Flora" and the "Handbook," confused the species with *P. natans*, it is difficult to be sure of the identity of the specimens he had before him. Its specific distinctness was first pointed out by Mr. Arthur Bennett, of Croydon, in the *Journal of Botany* for 1883 (p. 66), his description being based on specimens collected by myself in St. John's Lake, near Auckland. It is now known to be by far the most abundant member of the genus found in New Zealand, ranging from the North Cape to Stewart Island, and from sea-level to quite 4,000 ft. altitude.

P. Cheesemanii, in addition to the shape of its floating leaves, can be at once distinguished from *P. natans* by possessing numerous well-developed submerged leaves, which are much longer and proportionately much narrower than the floating leaves, and which gradually pass into them towards the upper part of the stem. In *P. natans* the submerged leaves are often absent, and if present are very narrow-linear and semi-terete, sometimes almost setaceous. According to Mr. Bennett (*Journal of Botany*, 1887, p. 177), *P. Cheesemanii* occurs in Tasmania as well as New Zealand.

In the last revision of the genus—that of Dr. Graebner, published in heft 31 of the "Pflanzenreich"—eighty-seven species are accepted. Of these, five are found in New Zealand, three of them (*P. natans*, *P. polygonifolius*, and *P. pectinatus*) being practically cosmopolitan. The remaining two extend to the Australian Continent.

PLATE 206. *Potamogeton Cheesemanii*, drawn from specimens collected on the Waikato River. Fig. 1, flower; 2 and 3, front and back view of anther, with perianth-segment; 4, carpels; 5, section of a carpel; 6, ripe carpels; 7, a single carpel separated from the rest; 8, section of ripe carpel; 9, seed. (All enlarged.)





M. Smith del.
J.N. Fitch lith.

West, Newman imp.

POTAMOGETON OCHREATUS, Raoul.

PLATE 207.—POTAMOGETON OCHREATUS.

FAMILY NAIADACEÆ.]

[GENUS POTAMOGETON, LINN.

Potamogeton ochreatus, Raoul, *Choix*, 13, t. 7; *A. Bennett in Journ. Bot.* xxv (1887), 178; *Cheesem. Man. N.Z. Fl.* 750.

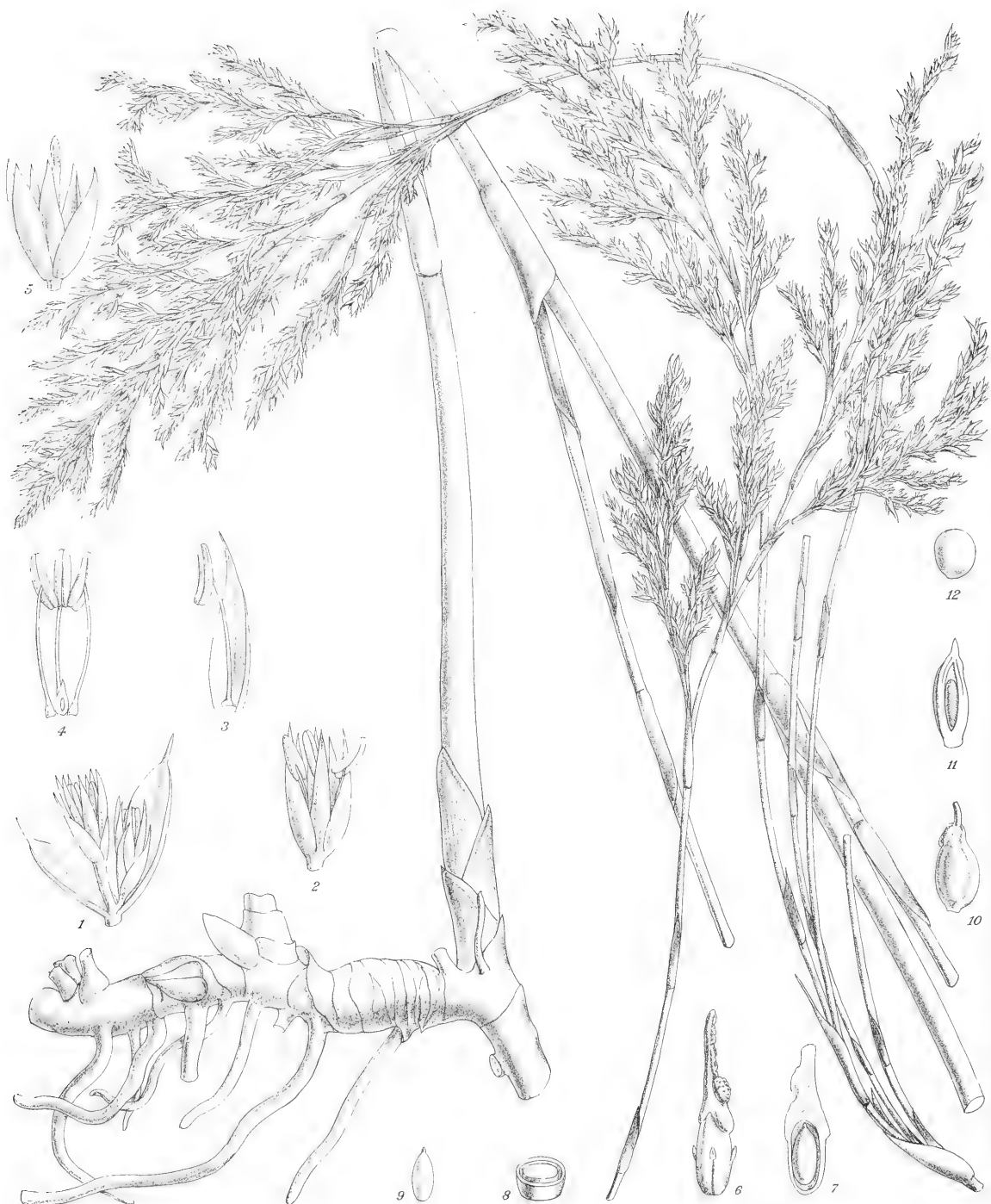
Potamogeton ochreatus was originally discovered by M. Raoul, who, as surgeon-naturalist to the French frigate "L'Aube," which was stationed at Akaroa from August, 1840, to November, 1841, and from January, 1842, to January, 1843, had excellent opportunities of examining the vegetation of Banks Peninsula and the neighbouring districts. After Raoul's return to France he published his discoveries first of all in the "Annales des Sciences Naturelles" (series iii, vol. 2); but in 1846 he incorporated them in a work of wider scope under the title of "Choix des Plantes de la Nouvelle Zélande," illustrated by thirty beautiful plates. A full description of *P. ochreatus* appeared in this work, together with a finely executed plate (t. 7).

Many views have been advanced respecting the systematic position of *P. ochreatus*. Sir J. D. Hooker, in the "Flora of New Zealand" (p. 236), suggested that it was identical with the widely spread *P. gramineus*, and in the "Handbook" he doubtfully referred it to that plant. Mr. Bentham, in the "Flora Australiensis," considered it to be a form of *P. obtusifolius*, Mert. and Koch, a determination which has been repudiated by subsequent workers. Mr. Kirk, in his first exploration of the Waikato River, expressed the opinion that it was identical with *P. zosteræfolius*; but he subsequently arrived at the conclusion that it was a separate species, "equally distinct from *P. compressus* and *P. gramineus*" (Trans. N.Z. Inst. iv (1872), 258). In 1887 the matter was fully investigated by Mr. Arthur Bennett, who fully proved the specific distinctness of the plant, and this view is now generally accepted.

P. ochreatus belongs to the section of the genus in which the whole of the leaves are submerged, and narrow-linear in shape, the broad floating leaves being entirely absent. It has a wide range in New Zealand, being common in slow-flowing streams and lakes from the North Cape to Otago, in many places forming dense masses. In Australia, according to Mr. Arthur Bennett, it ranges from Queensland to Tasmania; and Dr. Graebner has lately referred a Japanese plant to the same species.

PLATE 207. *Potamogeton ochreatus*, drawn from specimens collected in the Waikato River. Fig. 1, flower-bud; 2 and 3, flowers; 4, back of perianth-segment; 5, front view of perianth-segment, with stamen; 6, carpels; 7, a single carpel cut longitudinally; 8, young fruit; 9, section of same; 10, seed. (All enlarged.)





M. Smith del
J.N. Fitch lith.

West, Newman imp.

LEPYRODIA TRAVERSII, *F. Muell.*

PLATE 208.—LEPYRODIA TRAVERSII.

FAMILY RESTIACEÆ.]

[GENUS LEPYRODIA, R. BR.

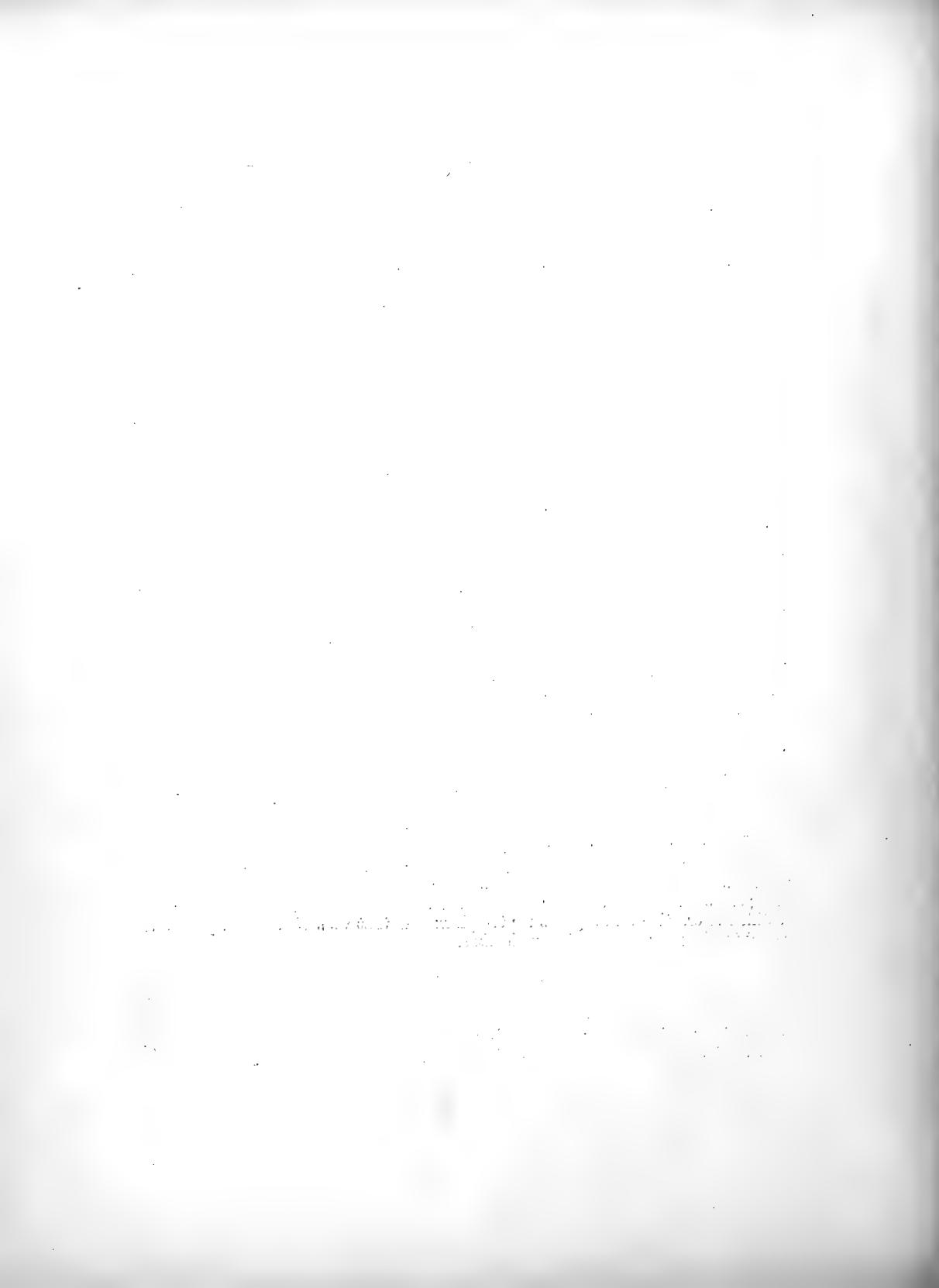
Lepyrodia Traversii, F. Muell. *Fragm.* viii, 79; *Cheesem. Man. N.Z. Fl.* 760.

Dr. Dieffenbach, the naturalist to the New Zealand Company, and the author of the well-known "Travels in New Zealand," visited the Chatham Islands in 1840, and formed a small collection of plants, which for many years comprised all that was known to science of the vegetation of that then seldom-visited outlier of the Dominion. Included in the collection were barren specimens of a Restiaceae plant which Sir J. D. Hooker, in the "Flora Novæ Zelandiæ" and again in the "Handbook," referred to as a doubtful species of *Calorophus*. Curiously enough, Mr. H. H. Travers, in his first expedition to the Chatham Islands, does not seem to have observed the plant; but during a subsequent visit he obtained specimens which Baron Mueller in the first instance described under the name of *Lepyrodia Traversii*, but ultimately erected into a new genus which he called *Sporadanthus*. According to Mueller, *Sporadanthus* differs from *Lepyrodia* in the nucular 1-celled fruit; but Hooker and Bentham, in the "Genera Plantarum," have replaced it in *Lepyrodia*.

Lepyrodia Traversii is a common plant in peat bogs in the Chatham Islands. Dr. Cockayne, in his valuable memoir, "On the Plant Covering of the Chatham Islands" (Trans. N.Z. Inst. xxxiv (1902), p. 285), gives a lengthy account of a plant association which he calls the "*Lepyrodia-Olearia* bog" in which the vegetation is largely composed of the *Lepyrodia*, together with *Olearia semidentata* and *Dracophyllum paludosum* (*D. scoparium*, var.), and speculates on the probability of this association having once occupied even more extensive areas than is now the case. Nor is *L. Traversii* confined to the Chatham Islands. In January, 1879, I observed it in great abundance in the extensive peat bog between Hamilton and Ohaupo, in the Middle Waikato district, a locality where it is still plentiful, although somewhat thinned by fires and drainage operations. And as recently as 1906 Mr. R. H. Matthews observed it in the large stretch of peaty country lying between Lake Tongongoe and the sea.

I have already remarked that in the "Genera Plantarum" Hooker and Bentham reduced *Sporadanthus* to *Lepyrodia*. They point out that in habit it is evidently very close to the Australian *L. scariosa*, R. Br., and hint that the fruit is 1-celled and 1-seeded by abortion. At that time fruiting specimens were alone known; but since then, through the kindness of Mr. Calhoun, of Ohaupo, I have received numerous fine specimens in all stages of flower and fruit, from which the accompanying plate has been prepared. After a careful examination of young flowers, I have been unable to find any trace of the ovary being 3-celled, nor does the ovary ever contain more than a single ovule. And the style is invariably single, with a decurrent stigma along one side. Under these circumstances, I am inclined to think that Mueller was justified in creating a new genus for the plant, and that we shall ultimately have to revert to his generic name of *Sporadanthus*.

PLATE 208. *Lepyrodia Traversii*, drawn from specimens gathered by Mr. Calhoun in the extensive peat bog stretching from Hamilton to Ohaupo, Waikato. Fig. 1, portion of inflorescence, with two male flowers ($\times 5$); 2, male flower ($\times 8$); 3, perianth-segment and stamen ($\times 10$); 4, stamens and rudimentary ovary ($\times 10$); 5, female flower ($\times 8$); 6, ovary with rudimentary stamens at the base ($\times 12$); 7, longitudinal section of ovary ($\times 12$); 8, transverse section of ovary ($\times 12$); 9, ovule ($\times 12$); 10, ripe fruit (enlarged); 11, longitudinal section of fruit (enlarged); 12, seed (enlarged).





M. Smith del.
J. N. Pritch lith.

West, Newman imp.

SCHOENUS CARSEI, *Cheesem.*

PLATE 209.—SCHÆNUS CARSEI.

FAMILY CYPERACEÆ.]

[GENUS SCHÆNUS, LINN.

Schœnus Carsei, *Cheesem. Man. N.Z. Fl.* 781.

The discovery of this interesting species is due to Mr. H. Carse, now a resident of Mongonui County, and well known as an active and zealous botanist. His first specimens were collected between Mauku and the southern shore of the Manukau Harbour, but he subsequently observed it in some quantity at Whangarei. On communicating some of Mr. Carse's specimens to the late Mr. C. B. Clarke, he informed me that the species was certainly distinct, but that there were examples of it in the Kew Herbarium, collected by Mr. T. Kirk in 1863 in swamps at Papatoetoe, near Auckland, and that these had been erroneously referred by Sir J. D. Hooker to the closely allied *S. pauciflorus*. A search in my own herbarium also disclosed some immature specimens collected by myself in the Ngairi Swamp, Taranaki. Quite recently it has been gathered by Mr. P. H. Allen in swamps by the Waitoa River, Thames Valley, and I cannot doubt but that it will be found to be plentiful in lowland swamps in the northern half of the North Island.

The nearest ally of *S. Carsei* is undoubtedly Hooker's *S. pauciflorus*. But it differs from that species in the much more slender habit, shorter leaves, much longer panicle with more numerous spikelets, by the bristles being either absent or very small, and in the white oblong nut, which is not at all trigonous, as is always the case in *S. pauciflorus*. The latter species differs also in its distribution, for it is either found in mountain districts or in the extreme south of the Dominion. In the Manual I stated that *S. Carsei* had no hypogynous bristles, but I find that three minute ones are generally present, as shown in fig. 4 of the accompanying plate. In *S. pauciflorus* the scales are long, almost equalling the style.

PLATE 209. *Schœnus Carsei*, drawn from specimens collected by Mr. H. Carse at Maungatāpere, Whangarei. Fig. 1, section of stem; 2, spikelet; 3, the same with the glumes removed; 4, filaments and the minute hypogynous bristles; 5, anther; 6, ovary and style-branches; 7, ripe nut. (All enlarged.)





M. Smith del.
J.N. Fitch lth.

West, Newman imp.

CLADIUM COMPLANATUM, *Berggr.*

PLATE 210.—CLADIUM COMPLANATUM.

FAMILY CYPERACEÆ.]

[GENUS CLADIUM, P. BROWNE.

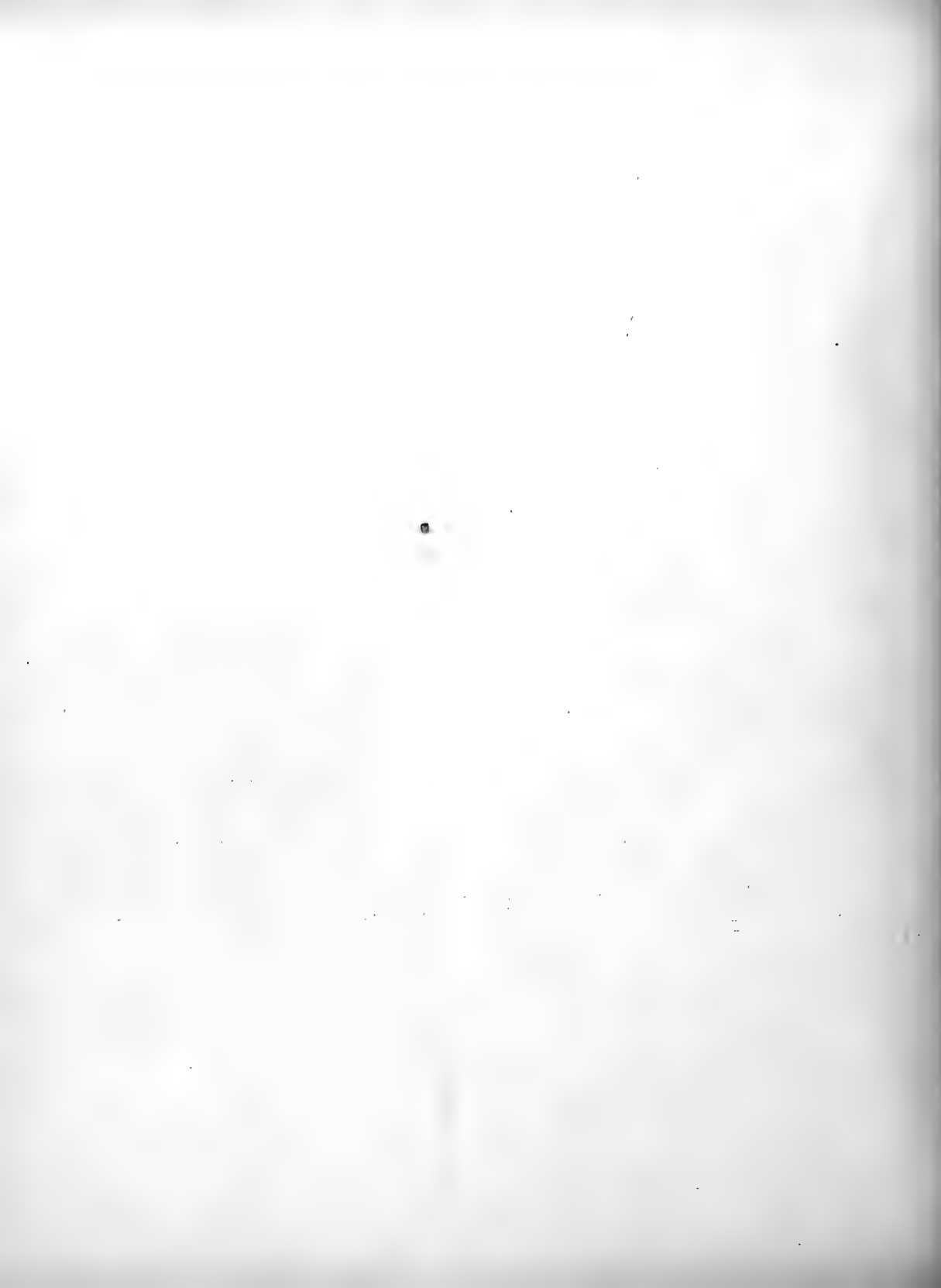
Cladium complanatum, Berggr. in *Minnesk. Fisiog. Sällsk. Lund* (1877), 23, t. 6, f. 1-5;
Cheesem. Man. N.Z. Fl. 785.

Dr. Sven Berggren, an accomplished Swedish botanist who spent the years 1874 and 1875 in investigating the botany of New Zealand, collected the subject of this plate during a visit paid to the North Auckland Peninsula, his specimens being obtained at Ohaeawai and Taheke, between the Bay of Islands and Hokianga. On his return to Sweden Dr. Berggren described the new Phanerogams which he had obtained in a memoir published in the "Minneskrift" of the University of Lund for 1877, including therein a plate and excellent description of *Cladium complanatum*. The plant was not again seen until 1890 or thereabouts, when Mr. T. Kirk collected specimens at Puhipuhi, between Whangarei and the Bay of Islands. Lastly, in 1898 Mr. H. Carse discovered an excellent locality for the species at Maungatapere, between Whangarei and the Northern Wairoa River. From the above it will be seen that the plant has a singularly restricted distribution, and has not yet been found outside the limits of the Bay of Islands and Whangarei Counties.

Cladium complanatum belongs to the subgenus *Baumea*, which is chiefly separated from the rest of the genus by the spikelets having one or rarely two perfect flowers, and by the nut being sessile, tumid at the apex, and not narrowed into a cuspidate beak. It thus includes the greater number of the species, and is most plentiful in Australasia, Polynesia, and Malaya, although it extends northwards to India and southern China, and westwards to Mauritius. So far as I am aware, the section *Baumea* does not occur in South Africa or in any part of America.

I was informed by the late Mr. C. B. Clarke that the nearest relative of *C. complanatum* is the New Caledonian *C. Deplanchei*, which comes very near to it indeed. It is perhaps worth mention that two New Zealand species—*C. junceum* and *C. articulatum*—actually occur in New Caledonia.

PLATE 210. *Cladium complanatum*, drawn from specimens collected by Mr. H. Carse at Maungatapere, Whangarei. Fig. 1, 2-flowered spikelet ($\times 6$); 2, spikelet ($\times 6$); 3 and 4, outer glumes ($\times 6$); 5, flower ($\times 8$); 6, anther (enlarged); 7, ovary and style-branches (enlarged); 8, ripe nut ($\times 4$); 9, seed with persistent filaments ($\times 5$).





M. Smith del.
J.N. Fitch lith

West, Newman imp.

CLADIUM SINCLAIRII, Hook. f.

PLATE 211.—CLADIUM SINCLAIRII.

FAMILY CYPERACEÆ.]

[GENUS CLADIUM, P. BROWNE.

Cladium Sinclairii, Hook. f. *Handb. N.Z. Fl.* 305; *Cheesem. Man. N.Z. Fl.* 785.

The discovery of this handsome plant is due to Banks and Solander, who collected it at Tolaga Bay in October, 1769, during Cook's first visit to New Zealand. It does not seem to have been observed again until Mr. Colenso gathered it in the early "forties" at the Bay of Islands, and in 1846 in Hawke's Bay. Shortly afterwards it was collected near Auckland by Dr. Sinclair, and at Mercury Bay by Mr. Joliffe. It is now known to be abundant in the northern portion of the North Island, from the North Cape to the Thames Valley; and from thence more sparingly southwards to the East Cape and Hawke's Bay on the eastern side of the Island, and to the Wanganui River on the west. Its altitudinal range is from sea-level to 2,000 ft.

C. Sinclairii is usually found on the faces of damp cliffs, either by the sea or along the banks of rivers; but it is also frequently seen in damp places in *Leptospermum* scrub. It forms large clumps often several feet in diameter, and frequently attains a height of 5 ft. or even more. The broad and flat deep-green equitant leaves give the plant a very striking appearance, and we can readily agree with Dr. Solander, who in his original description stated that in the absence of flowers it could be easily taken for an iris or gladiolus. The large excessively branched nodding panicles, with their innumerable rich dark red-brown velvety spikelets, are really very handsome, and it is somewhat surprising that the plant has not found its way into cultivation.

C. Sinclairii falls into the section *Vincentia* of the genus *Cladium*, which is mainly distinguished by the stipitate triquetrous nut, which is narrowed both to the base and apex (see fig. 5 in the accompanying plate). In addition to the New Zealand plant, the section includes eight other species, of which three are found in South America, one of them extending to Mauritius as well, one in Juan Fernandez, two in Polynesia, one in Lord Howe Island, and one in Sumatra.

It should be mentioned that in *C. Sinclairii* the filaments are persistent, and elongate greatly during the ripening of the fruit, to the base of which they are usually attached. When the nut drops from the glumes it often remains swinging by the entangled filaments, exactly as in *Gahnia* (see the following plate, and fig. 6 of the present one).

PLATE 211. *Cladium Sinclairii*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, small portion of inflorescence; 2, a single spikelet; 3, a single flower with its glume; 4, anther; 5, ovary with style and style-branches; 6, ripe nut swinging from the spikelet by the entangled persistent filaments (all enlarged); 7, a single culm, with leaves and inflorescence (reduced to one-third natural size)





M. Smith del.
J.N. Fitch lith.

West, Newman imp.

GAHNIA PROCERA, Forst.

PLATE 212.—GAHNIA PROCERA.

FAMILY CYPERACEÆ.]

[GENUS GAHNIA, FORST.

Gahnia procera, Forst. *Char. Gen.* 52; Hook. *J. Handb. N.Z. Fl.* 306; Cheesem. *Man. N.Z. Fl.* 791.

This very distinct species was discovered by the two Forsters in Dusky Sound in 1773 during Cook's second voyage to New Zealand. After the return of the expedition to England the Forsters described the plant in their "Characteres Generum" as the type of a new genus, under the name of *Gahnia procera*; and it appeared under the same title in George Forster's subsequently issued "Prodromus." The descriptions given in both these works are vague and incomplete; but a much fuller account of the plant is quoted from Forster's manuscripts in A. Richard's "Flore." For a considerable period no further information was obtained; but between the years 1848-51 it was gathered at Port Preservation by Lyall; and in 1864, or thereabouts, it was obtained by Mr. Buchanan in the south-west of Otago. Since then it has been proved to have a wide range in the western and southern portions of the South Island, from the Karama River to the Sounds of the south-west coast of Otago, and from thence to the Bluff and Stewart Island. It is usually found in open forests, and ascends to an altitude of 2,500 ft.

Gahnia procera is one of the most strongly marked species of the genus, and can be distinguished at a glance by the stout moderately tall culms, large purplish-black leaf-sheaths and spikelets, long empty glumes, and large red-brown nut. As in all the New Zealand species, the filaments elongate to an extraordinary extent after the fall of the pollen, and ultimately reach the length of from 1 in. to 2 in., or many times the length of the flowering-glumes. In most instances they remain attached to the base of the nut when it drops from the flower, and as the other end of the filament is usually entangled with the glumes or with the filaments of other flowers, the nut remains swinging by the filaments but otherwise quite free from the spikelet (see fig. 6 of the accompanying plate). The nut of *G. procera* is remarkable for its stony hardness, and for being transversely grooved within. As the seed completely fills the cavity of the nut, it presents the appearance, when withdrawn from the nut, of being surrounded by conspicuous elevated ridges or laminae (see figs. 7 to 10).

The genus *Gahnia* comprises about thirty species. Of these, thirteen or fourteen are known from Australia; eight from New Zealand; six or eight from Polynesia, from New Caledonia to the Fiji Islands, Tahiti, and the Sandwich Islands; and one species extends as far north as Malaya.

PLATE 212. *Gahnia procera*, drawn from specimens collected by Mr. Townson in the vicinity of Westport. Fig. 1, spikelet ($\times 2$); 2, third glume (enlarged); 3, fourth or inner glume and style-branches, also the lower part of the filaments ($\times 4$); 4, anther (enlarged); 5, ovary and style-branches (enlarged); 6, ripe nut swinging from the spikelet by the entangled filaments ($\times 2$); 7, section of nut; 8, the same with the seed removed; 9, seed; 10, section of seed; 11, embryo. (All enlarged.)



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

UNCINIA CAESPITOSA, Boott.

PLATE 213.—UNCINIA CÆSPITOSA.

FAMILY CYPERACEÆ.]

[GENUS UNCINIA, PERS.]

Uncinia cæspitosa, Boott in Hook. f. *Fl. Nov. Zel.* i, 287; *Cheesem. Man. N.Z. Fl.* 801.

Uncinia cæspitosa was gathered by Mr. Colenso in several localities in the middle and southern portions of the North Island during the years 1845 to 1850, as the Ruahine Range, the Wairarapa Valley, and Port Nicholson. I am not aware that it was observed by any other botanist until 1869, when Mr. Kirk collected it at the Thames goldfields. In 1871 I obtained it on the Waitakerei Ranges, and in subsequent years in other localities north of Auckland. The first record of its occurrence in the South Island is that of Mr. A. Hamilton, who in 1877 collected it in the vicinity of Okarito, in southern Westland; but it was soon found in other districts. Its range in the Dominion is now known to extend from Hokianga in the north to Stewart Island in the south; but it is rare and local to the north of Lake Taupo. In the South Island it is common in montane districts, especially where wooded; and it ascends to an elevation of at least 3,000 ft.

As a species *U. cæspitosa* is nearest to *U. purpurata*, from which it principally differs in the acuminate glumes, which but slightly exceed the utricles in length; whereas in *U. purpurata* the glumes are obtuse, and are usually much shorter than the utricles. *U. cæspitosa* has often been confounded with small and slender states of *U. australis*; but all such can be distinguished by the much longer spikelets and more brightly coloured glumes, to say nothing of other differences.

The geographical distribution of *Uncinia* is interesting. Of the twenty-four species admitted by Kuntenthal in his recent revision of the genus ("Das Pflanzenreich," heft 38), thirteen are found in New Zealand. But one of these extends to Kerguelen Island, another to the Sandwich Islands, and a third to South America, while three stretch to Tasmania or Australia, one of them also advancing as far north as New Guinea. South America has twelve species, one of which is found as far north as Mexico and the West Indies, another occurs in the Falkland Islands and Tristan d'Acunha, and a third, as already mentioned, reaches New Zealand. The New Zealand species all belong to the section *Stenandra*, in which the filaments are filiform; but half of the American species constitute the section *Platyandra*, which has the filaments linear and flattened.

PLATE 213. *Uncinia cæspitosa*, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an elevation of 4,000 ft. Fig. 1, glume of male flower (enlarged); 2, stamens (enlarged); 3, glume of female flower (enlarged); 4, female flower ($\times 4$); 5, utricule ($\times 5$); 6, section of utricule ($\times 5$); 7, nut and bristle ($\times 5$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

CAREX TRACHYCARPA, *Cheesem.*

PLATE 214. —CAREX TRACHYCARPA.

FAMILY CYPERACEÆ.]

[GENUS CAREX, LINN.

Carex trachycarpa, *Cheesem.*, in *Trans. N.Z. Inst.* xxiv (1892), 113; *Cheesem. Man. N.Z. Fl.* 812.

Carex trachycarpa was first observed by myself in January, 1882, on the northern face of Mount Owen, Nelson, which I reached by following to its source the Rolling River, the chief tributary of the Wangapeka. It was gathered in damp places near the junction of the granitic rocks with the limestone which forms the greater portion of Mount Owen, but did not appear to be at all plentiful. All my specimens were in an immature state, and in that condition presented such a close general resemblance to the northern *C. muricata* that I at first referred it to that species. In 1886, however, I gathered fully mature examples on Mount Arthur, when the distinctness of the two plants became perfectly obvious. Mr. Townson, in his exploration of the western portion of the Nelson Provincial District, gathered the plant on Mount Lyell and Mount Mantell, and also on Mount Faraday, one of the chief peaks of the Paparoa Range, so that it evidently has a tolerably wide distribution on the western side of the South Island. So far it does not seem to have been gathered by any other botanists. Its altitudinal range is from 3,000 ft. to well over 4,500 ft.

As a species *C. trachycarpa* is more nearly allied to some of the larger forms of *C. Kirkii* than to any other New Zealand species of the genus. But *C. Kirkii* is much smaller and much more slender, the leaves are almost filiform, and the utricles are longer and narrower, with a much longer beak. In both species they are strongly nerved, and minutely papillose all over. Kuenthal, in his recent revision of the genus, places *C. trachycarpa* in the section *Bracteosa*, while *C. Kirkii* and its allies are included in the subsection *Australis* of the section *Arenaria*. But to my mind the two species should be placed in close juxtaposition. This was also the opinion of the late Mr. C. B. Clarke, as shown by his enumeration of the species printed in the Kew Bulletin ("Additional Series," viii, 139).

PLATE 214. *Carex trachycarpa*, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an altitude of 4,500 ft. Fig. 1, male and female flowers ($\times 6$); 2, male flowers ($\times 6$); 3, glume of female flower ($\times 6$); 4, utricle ($\times 8$); 5, longitudinal section of utricle ($\times 8$).





M. Smith del.
J.N. Fitch lith.

West, Newman imp.

CAREX RAOULII, Boott.

PLATE 215.—CAREX RAOULII.

FAMILY CYPERACEÆ.]

[GENUS CAREX, LINN.

Carex Raoulii, Boott in Hook. j. Fl. Nov. Zel. i. 283; Cheesem. Man. N.Z. Fl. 821.

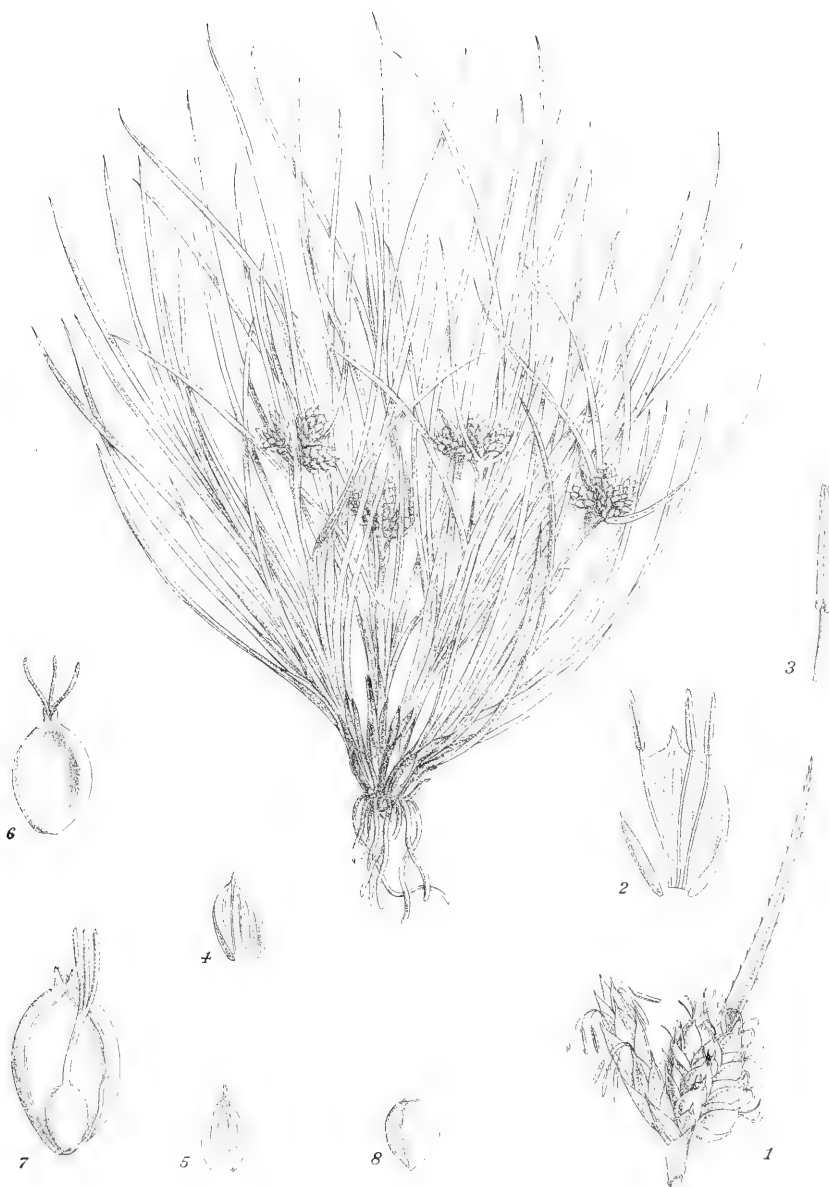
Dr. M. E. Raoul, the talented naturalist attached to the French frigate "L'Aube," was the first to collect the subject of this plate. "L'Aube" was stationed at Akaroa to watch over the fortunes of the infant French colony which it was hoped to found there, and during her stay of more than two years Raoul was able to make an extensive collection of the plants of the district, amongst which was the species now known as *Carex Raoulii*. Raoul does not appear to have recognized its specific distinctness, for no mention is made of it in his "Choix des Plantes de la Nouvelle Zélande," published in 1846; and it was first described by Boott in 1853 in Hooker's "Flora Novæ Zelandiæ." In 1861 Dr. Sinclair and Sir Julius von Haast collected it in the Rangitata Valley, Canterbury; and shortly afterwards it was gathered near Lake Wanaka, Otago, by Mr. J. Buchanan. During the years 1881 to 1886 I found it not uncommon in many localities in the Nelson Provincial District; and it is now known to extend throughout the whole length of the South Island, although I have seen no specimens collected on the western side of the Southern Alps. Its altitudinal range is from 200 ft. to 3,000 ft.

Carex Raoulii is one of the most distinct species of the genus found in New Zealand, and can always be recognized at a glance. Its distinguishing characters are the loose and open habit of growth, the comparatively broad and coarse flat leaves, the terminal spikelet always partly female, and the elliptical strongly nerved and serrate utricles. Mr. C. B. Clarke informs me that Raoul's original specimens all have the utricles hairy on the upper half, as figured in this plate, but I have not myself seen specimens showing this peculiarity.

C. Raoulii has no very close allies, but, on the whole, is best placed in the neighbourhood of *C. dipsacea*, *C. testacea*, and *C. Wakatipu*, which agree with it in the oval or elliptic unequally biconvex utricle, with an obviously 2-toothed beak; and in the two stigmas. None of these plants, however, has the peculiar habit of *C. Raoulii*, or has its terminal spikelet composed of both male and female flowers.

PLATE 215. *Carex Raoulii*, drawn from specimens collected by the Graham River, Nelson. Fig. 1, a spikelet, female flowers above, male below ($\times 2$); 2, glume of male flower ($\times 8$); 3, stamen ($\times 8$); 4, glume of female flower ($\times 8$); 5, utricle ($\times 8$); 6, section of same, showing nut ($\times 8$); 7, ripe nut removed from the utricle ($\times 10$).





M Smith del
J N Fitch lith.

West, Newman imp.

CAREX DECURTATA, *Cheesem.*

PLATE 216.—CAREX DECURTATA.

FAMILY CYPERACEÆ.]

[GENUS CAREX, LINN.

Carex decurtata, *Cheesem.* in *Trans. N.Z. Inst.* xxiv (1892), 414; *Cheesem. Man. N.Z. Fl.* 827.

Carex decurtata was originally discovered by myself in January 1883, growing on the dried-up margins of pools near Lake Tekapo, South Canterbury, at an altitude of about 2,500 ft. I first described it under the name of *C. cryptocarpa*, from the fact that the leaves at all times considerably overtop and thus conceal the culms, even when the latter are in fruit, but the name had been preoccupied by an Arctic species, and had to be abandoned. In 1897 I again gathered it in the same locality, finding it not uncommon all round the southern end of Lake Tekapo, and stretching along the western side of the lake, in low-lying places, as far as the valley of the Cass River. So far as I am aware, it has not been found in any other district.

C. decurtata belongs to a singular group of small-sized species, seldom more than 4 in. or 5 in. in height, in which the culms are concealed by the leaves, the spikelets being sessile and approximate at the tops of the culms. Two of the species (*C. cirrhosa* and *C. rubicunda*) have two stigmas and a more or less plano-convex utricule; while four others (*C. Berggreni*, *C. Hectori*, *C. uncifolia*, and *C. decurtata*) have three stigmas and a trigonous utricule. Of these, *C. Berggreni* is the most interesting, on account of the flat leaves with remarkable obtuse tips. The whole group is confined to New Zealand, and has no near allies in any other country.

C. decurtata is usually of a very peculiar glaucous green, and forms very dense low tussocks, often of considerable diameter. These tussocks often die out in the centre in old age, leaving a hollow ring which grows on vigorously, thus presenting a decidedly curious appearance.

PLATE 216. *Carex decurtata*, drawn from specimens collected near Lake Tekapo, South Canterbury, at an altitude of 2,500 ft. Fig. 1, male and female spikelets ($\times 2$); 2, glume from male flower and stamens ($\times 6$); 3, anther ($\times 10$); 4 and 5, glumes from female flowers ($\times 6$); 6, utricule (face incorrectly represented as concave) ($\times 6$); 7, section of utricule, showing nut ($\times 10$); 8, nut ($\times 10$).





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

CAREX LITOROSA, Bailey.

PLATE 217.—CAREX LITOROSA.

FAMILY CYPERACEÆ.]

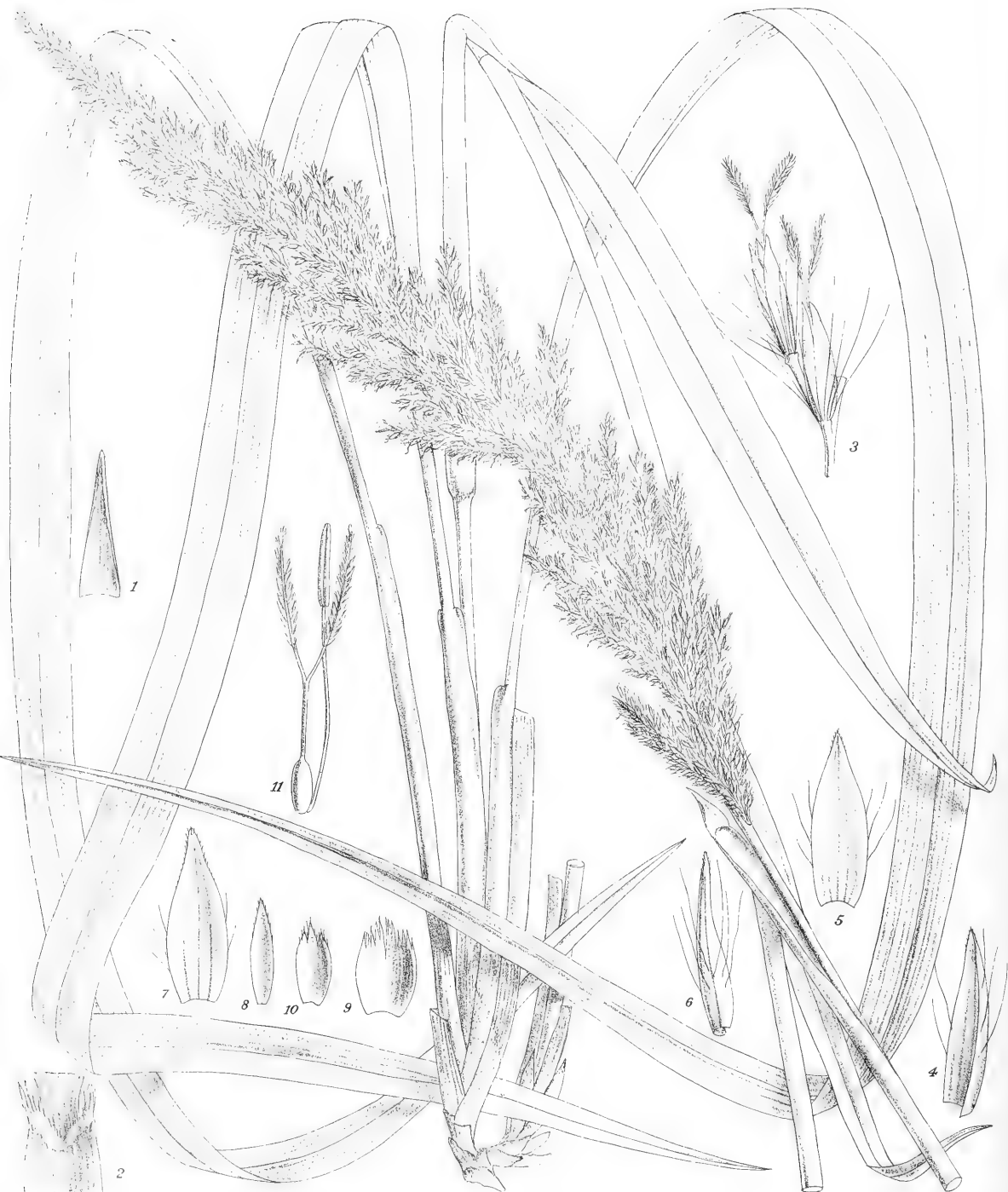
[GENUS CAREX, LINN.]

Carex litorosa, Bailey in *Memoirs Torrey Club* (1889), 72; *Cheesem. Man. N.Z. Fl.* 830.

Carex litorosa appears to have been first collected by the late Mr. T. Kirk at the Onehunga Springs, close to the shore of the Manukau Harbour, where it grows in company with *Mimulus repens* and other brackish-water plants. It was shortly afterwards observed by myself in salt marshes at Whangarei, Kaipara, Thames, and Tauranga; and by Mr. Petrie at Port Chalmers and on Stewart Island. It has since been found by many collectors on various portions of the coast-line, and is now known to be an abundant plant in brackish-water swamps from Whangarei and the Kaipara Harbour southwards to Stewart Island. It was first published by Mr. Petrie as *C. littoralis*; but as that name had already been used for a North American plant, Mr. L. H. Bailey suggested that of *C. litorosa* in its place.

As to its relationships, *C. litorosa* is closely allied to the Stewart Island *C. longiculmis*, also a brackish-water plant. But that species is much taller and stouter, with flatter leaves quite twice the breadth of those of *C. litorosa*, and the spikelets are much larger and stouter. In fact, *C. longiculmis* is conspicuously larger in all its parts. *C. comans* is also related to it, but is smaller and much more slender, and the habit is not nearly so strict. The utricles are also narrower, almost plano-convex, and the margins are sharply serrate above, whereas they are smooth in *C. litorosa*.

PLATE 217. *Carex litorosa*, drawn from specimens gathered at Onehunga, near Auckland. Fig. 1, male and female spikelets ($\times 2$); 2, tip of bract ($\times 2$); 3, male flower and its glume ($\times 8$); 4, anther ($\times 12$); 5, female flower (utricle) and its glume ($\times 8$); 6, glume from female flower ($\times 8$); 7, longitudinal section of utricle, showing nut ($\times 8$); 8, cross-section near tip of utricle, showing the thickened wall (enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

IMPERATA CHEESEMANII, Hackel.

PLATE 218.—IMPERATA CHEESEMANII.

FAMILY GRAMINEÆ.]

[GENUS IMPERATA, CYR.]

Imperata Cheeseemanii, Hack. in *Trans. N.Z. Inst.* xxxv (1903), 378; *Cheesem. Man. N.Z. Fl.* 843.

This handsome grass was first discovered by myself in August, 1887, on Raoul or Sunday Island, the chief island of the Kermadec Group. At the time of my visit it was abundant, especially on cliffs and steep slopes on the northern side of the island. Mr. R. B. Oliver, who spent the greater portion of 1908 on Sunday Island for the purpose of examining its vegetation, also found it not uncommon. He records it from talus slopes on the cliffs and on the slopes leading down to the central crater, from sand-dunes (where it grows intermixed with *Ipomæa biloba*), and from the gravel-flat in Denham Bay. I suspect, however, that with *Imperata*, as with several other Kermadec Islands plants, the great increase in the number of goats has reduced the area of distribution of the plant since the time of my visit.

In my account of the "Flora of the Kermadec Islands" (*Trans. N.Z. Inst.* xx (1888), 175) I referred the species to the widely distributed *I. arundinacea*, Cyr. This, however, was a mistake, as was first pointed out by Professor Hackel, who described it under its present name. He remarks that it is much nearer to *I. exaltata*, Brong., the typical form of which ranges from the Philippine Islands and the Malay Archipelago to the New Hebrides, and which in a slightly different form (var. *caudata*) stretches from Mexico and the West Indies to Argentina. Our plant is much smaller in all its parts.

The genus *Imperata* is widely distributed in the tropical regions of both hemispheres, but the number of species probably does not exceed six or seven. *I. arundinacea*, which is the best-known member of the genus, has been collected near Kaitia by the late Mr. R. H. Matthews, but there is a suspicion that it is naturalized only.

PLATE 218. *Imperata Cheeseemanii*, drawn from specimens collected on seaciffs on Sunday, or Raoul, Island. Fig. 1, tip of leaf (enlarged); 2, ligule (enlarged); 3, two spikelets ($\times 8$); 4, outer glume; 5, same seen from the front; 6, second glume; 7, the same seen from the front; 8, third glume; 9, palea; 10, flowering-glume (all enlarged); 11, ovary, style, and stamen removed from the spikelet ($\times 10$).



M. Smith del
J.N. Fitch lith

West, Newman imp.

EHRHARTA COLENSOI, Hook. f.

PLATE 219.—EHRHARTA COLENZOI.

FAMILY GRAMINEÆ.]

[GENUS EHRHARTA, THUNB.

Ehrharta Colensoi, Hook. f. *Fl. Nov. Zel.* i, 288; *Cheesem. Man. N.Z. Fl.* 851.

Ehrharta Colensoi was originally discovered by Mr. Colenso in his first journey to the Ruahine Range, in February, 1845, when he found it growing in "cushion-like patches, or large tufts, scattered here and there," on the crest of the range. For many years very little attention was paid to the New Zealand grasses, and it was not until 1875 that the plant was again seen, when it was collected on the Taranua Mountains by Mr. H. H. Travers. In 1880 I observed it on the mountains above Arthur's Pass, Canterbury; and in the same year it was detected on Mount Arthur, Nelson, by Mr. McKay. It is now known to be fairly plentiful in mountain districts from the Ruahine Mountains to Lake Te Anau. Its altitudinal range is from 3,000 ft. to 5,500 ft.

The genus *Ehrharta* has two species in New Zealand; the second one (*E. Thomsoni*) being a much smaller plant than *E. Colensoi*, with a more southern distribution, its range extending from Mount Rochfort, near Westport, to the south-west of Otago, Stewart Island, and the Auckland Islands. Outside New Zealand, there are twenty-five species in South Africa, Arabia, and the Mauritius. Two of the African species have become naturalized in Australia, and one in India. The genus is very close to the Australian and New Zealand *Microlæna*; in fact, the two New Zealand species appear to me to be nearer to *Microlæna* than *Ehrharta*. *Ehrharta* usually has six stamens, but both *E. Colensoi* and *E. Thomsoni* have two only. In *Microlæna* the number of stamens is either two or four.

PLATE 219. *Ehrharta Colensoi*, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an altitude of 4,000 ft. Fig. 1, ligule of leaf; 2, tip of leaf; 3, spikelet; 4, 5, and 6, the three lower glumes of the spikelet; 7, upper or fourth glume, flower-ring-glume, and palea; 8, upper glume seen separately; 9, flowering-glume; 10, palea; 11, lodicules; 12, stamens, with ovary and styles; 13, seed. (All enlarged.)





West, Newman imp.

M. Smith del
J. N. Pritch lith.

HIEROCHLOE FRASERI, Hook. f.

PLATE 220.—HIEROCHLOE FRASERI.

FAMILY GRAMINEÆ.]

[GENUS HIEROCHLOE, GMEL.

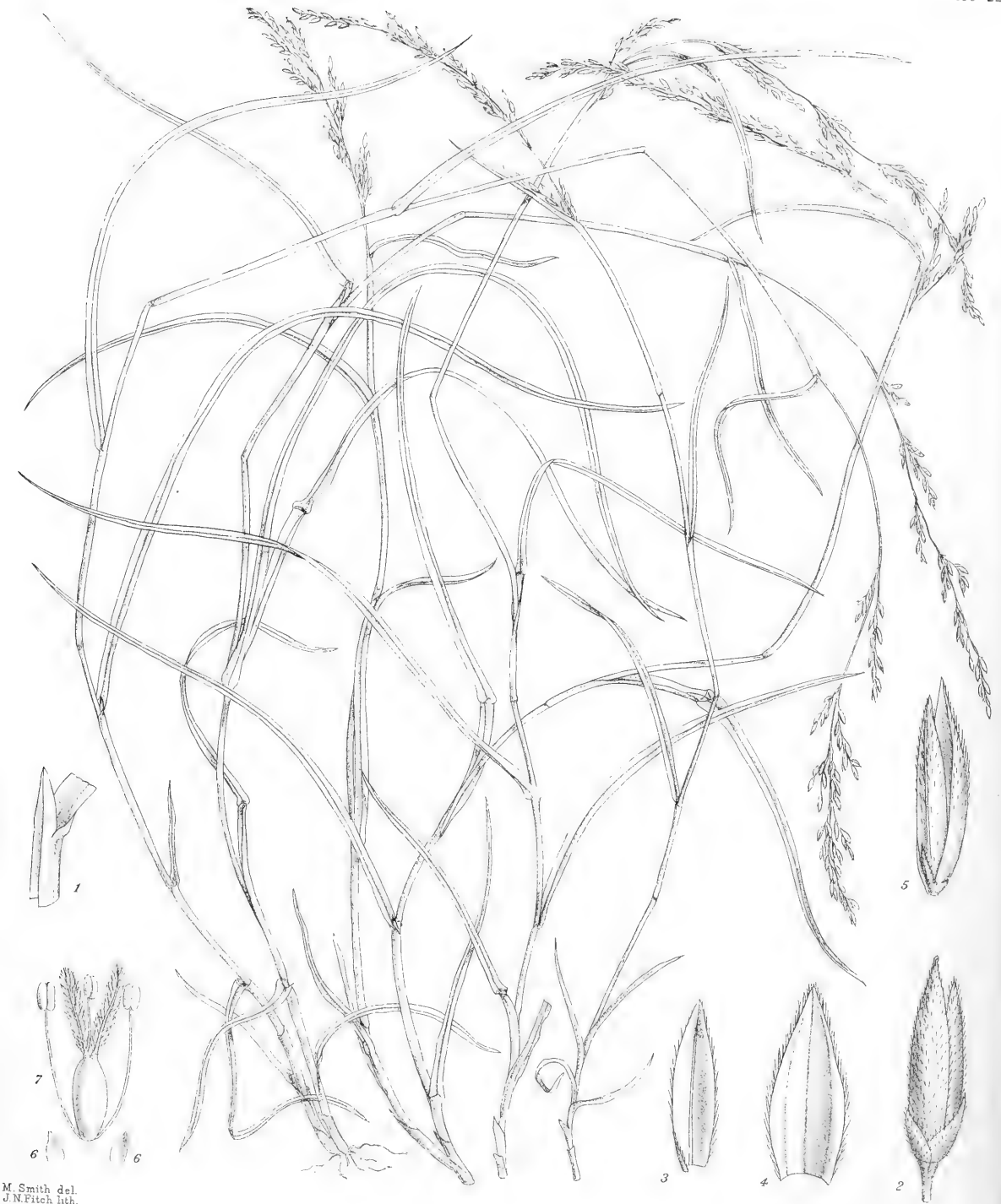
Hierochloe Fraseri, Hook. f. *Fl. Antart.* i, 93; *Cheesem. Man. N.Z. Fl.* 855.

The first specimens of this handsome grass collected in New Zealand were obtained by Mr. Colenso during his first journey to the Ruahine Mountains in 1845. A few years later it was gathered by Sir D. Monro on the Nelson mountains; and further research has shown that it is a common species in subalpine districts from the East Cape and Tongariro southwards to Stewart Island. In fact, there are few subalpine meadows in New Zealand where it is not an abundant and conspicuous species. In the North Island I have not seen it at a lower elevation than 2,500 ft., but it comes down to sea-level in the south of Otago and in Stewart Island. It has not yet been recorded from the Auckland or Campbell Islands, but I cannot doubt that it will eventually be found thereon. It also exists in mountain districts in Tasmania.

There has been much misconception respecting the systematic position of *H. Fraseri*. Sir J. D. Hooker originally accepted it as a distinct species, but in the "Flora" he referred it to the Arctic *H. borealis*, and in the "Handbook" to *H. alpina*. Mr. Benthams, in the "Flora Australiensis," treated it as a variety of *H. redolens*, and no doubt the two species are more or less connected by intermediate forms. In the Manual I have followed Professor Hackel in keeping it as a separate species, confined to the Southern Hemisphere.

H. Fraseri must be of some economic importance in the higher sheep-pastures of the South Island, although most runholders that I have spoken to on the subject say that it is not particularly relished by either sheep or cattle. I am inclined to think that it is not without value on wet peaty moorlands, on which there is often a difficulty in establishing imported grasses.

PLATE 220. *Hierochloe Fraseri*, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an altitude of 4,000 ft. Fig. 1, ligule; 2, spikelet; 3 and 4, outer glumes; 5, flowering-glume and palea; 6, flowering-glume; 7, palea; 8, lodicules; 9, stamen; 10, ovary and styles; 11 and 12, palea of female flower; 13, ovary and styles; 14, terminal flower. (All enlarged.)



M. Smith del.
J. N. Fitch lith.

SIMPLICIA LAXA, T. Kirk.

West, Newman imp.

PLATE 221.—SIMPLICIA LAXA.

FAMILY GRAMINEÆ.]

[GENUS SIMPLICIA, T. KIRK.]

Simplicia laxa, T. Kirk in *Trans. N.Z. Inst* xxix (1897), 497; *Cheesem. Man. N.Z. Fl.* 861.

The monotypic genus *Simplicia* possesses considerable interest to New Zealand botanists, on account of being the only genus of grasses that is peculiar to New Zealand. It was one of the many discoveries of the late Mr. T. Kirk, and was first collected by him at the Dry River Station, Ruamahanga, Lower Wairarapa, in January, 1880. Shortly afterwards it was observed by Mr. Petrie at Waikouaiti and Deep Stream, Otago. No further localities have been discovered; but it must be borne in mind that the species is an inconspicuous one, which could hardly be recognized except in the short flowering season, and which even then could be easily overlooked. In all probability a special search would reveal several fresh stations for it.

Simplicia is a somewhat isolated genus. Mr. Kirk, in describing it, quoted an opinion of Dr. Stapf's to the effect that it was pretty close to certain species of the North American genus *Muhlenbergia*, principally differing in the presence of a minutely produced rhachilla. Professor Hackel, who has done me the favour of examining a series of specimens, is inclined to the belief that it is intermediate between *Sporobolus* and *Agrostis*. It agrees with the first in the proportions of the outer glumes, but differs in the presence of the rhachilla; and, on the whole, is nearest to the section *Chatotropis* of *Agrostis*, which is often kept as a distinct genus.

In the Manual I have described the number of stamens as one or two. I find, however, that it not infrequently has the full number of three, as shown in fig. 7 of the accompanying plate.

PLATE 221. *Simplicia laxa*, drawn from specimens collected by Mr. Petrie at Waikouaiti, Otago. Fig. 1, ligule of leaf; 2, spikelet; 3 and 4, empty glumes; 5, flowering-glume and palea; 6, lodicules; 7, stamens, ovary, and styles. (All enlarged.)





AGROSTIS DYERI, *Petrie.*

West, Newman imp.

PLATE 222.—AGROSTIS DYERI.

FAMILY GRAMINEÆ.]

[GENUS AGROSTIS, LINN.

Agrostis Dyeri, *Petrie in Trans. N.Z. Inst.* xxii (1890), 441; *Cheesem. Man. N.Z. Fl.* 861. *A. canina*, *Hook. f. Fl. Nov. Zel.* i, 296 (*not. of Linn.*).

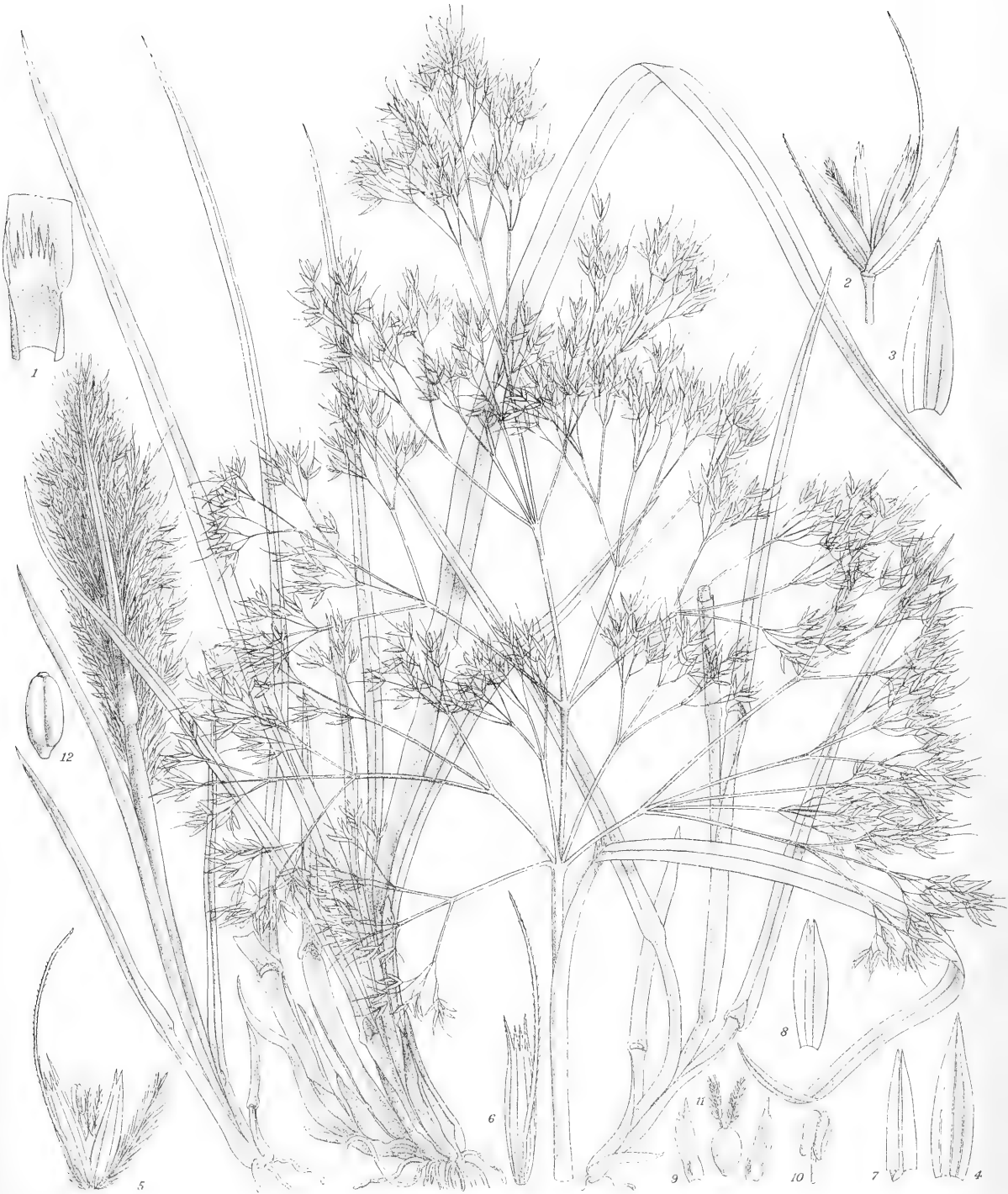
Dr. Lyall, the coadjutor of Sir J. D. Hooker in the botanical exploration of the Auckland and Campbell Islands, and a diligent explorer of the botany of the south-western and southern coasts of the South Island of New Zealand, appears to have been the first to collect this grass, having obtained specimens in Milford Sound. Sir Julius von Haast and Dr. Sinclair gathered it on the Southern Alps in 1861, and from that time onwards it has been noticed by every botanist who has examined the vegetation of the mountain districts of both the North and South Islands. From the East Cape, Tongariro, and Mount Egmont southwards to Stewart Island it is of universal occurrence on the high-lying meadows above the level of the bush-line, and often constitutes a considerable proportion of the subalpine vegetation. It is most abundant at elevations between 2,500 ft. and 4,000 ft., but ascends to fully 5,000 ft., and descends to low levels in Southland and Stewart Island.

Sir J. D. Hooker, in both the "Flora" and the "Handbook," referred our plant to the northern *A. canina*, and it was not until 1890 that it was first separated as a species by Mr. Petrie. I am much indebted to Professor Hackel for undertaking the examination of a large series of specimens from various portions of the Dominion, and for a very complete report thereon, in which he points out how the species differs from *A. canina*. For a synopsis of this the reader should refer to my "Manual of the New Zealand Flora."

Although *A. Dyeri* is not a grass of the first quality, it is nevertheless of considerable economic importance on many of the sheep-pastures of the South Island. Like most of the Bent grasses, its foliage is short and somewhat sparse, and its total bulk of herbage comparatively small. But stock appear to like it, and it deserves to be experimented with in high cool localities.

PLATE 222. *Agrostis Dyeri*, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an altitude of 4,000 ft. Fig. 1, tip of leaf; 2, ligule of leaf (both enlarged); 3, small portion of inflorescence ($\times 6$); 4 and 5, two outer glumes ($\times 10$); 6, flowering-glume ($\times 10$); 7, flower, with lodicules, stamens, ovary, and styles ($\times 15$); 8, ovary ($\times 12$).





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

DEYEUXIA BILLARDIERI, Kunth.

PLATE 223.—DEYEUXIA BILLARDIERI.

FAMILY GRAMINEÆ.]

[GENUS DEYEUXIA, CLARION.

Deyeuxia Billardieri, Kunth. *Rev. Gram.* i, 77; Hook. *f. Fl. Nov. Zel.* i, 298; Cheesem. *Man. N.Z. Fl.* 869.

Deyeuxia Billardieri was originally collected by Banks and Solander during Cook's first voyage, and is recorded in Dr. Solander's manuscript Flora from every locality in which Cook actually landed. This is not altogether surprising; for it is purely a coastal plant, found on sand-dunes, in brackish-water marshes, and on seacliffs, and would be certainly observed by a party of naturalists whose explorations would seldom extend far from the shore, and who in landing from their vessel and in rejoining their boat at night must necessarily spend a considerable time on the actual shore. And, as with many other plants, it cannot be doubted that it would be more abundant before the introduction of domestic animals than now. All subsequent botanists have observed it, and it can be roundly stated to be generally distributed in coastal localities from the Three Kings Islands and the North Cape to Stewart Island. It has also been recorded from the Chatham Islands, and in Australia ranges from New South Wales to South Australia.

Deyeuxia Billardieri is a handsome plant, and is well worth cultivation in gardens, from the large size of its fully developed panicle, with its spreading branches and slender almost capillary pedicels. The spikelets, too, are often of a rich purplish-brown. The late Mr. Buchanan considered it to be a grass of considerable value for pasturage, and he also stated that some varieties are perennial. But all the states that I have examined have proved to be annual; and although early in spring the plant produces a fair amount of short broad leaves which are evidently relished by cattle, such are of short duration, and perish early in summer.

The nearest ally of *D. Billardieri* is undoubtedly the much more widely spread *D. Forsteri*, from which, however, it can be readily distinguished by the shorter and stouter habit, broader leaves, much larger spikelets, and by the flowering-glume being silky at the base only.

PLATE 223. *Deyeuxia Billardieri*, drawn from specimens collected on the Little Barrier Island. Fig. 1, ligule of leaf ($\times 2\frac{1}{2}$); 2, spikelet ($\times 6$); 3 and 4, outer glumes ($\times 6$); 5, flower, showing flowering-glume, palea, and rhachilla ($\times 6$); 6, dorsal view of flowering-glume ($\times 6$); 7 and 8, palea ($\times 6$); 9, lodicules ($\times 8$); 10, anther ($\times 8$); 11, ovary, with styles ($\times 8$); 12, fruit (enlarged).





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

DESCHAMPSIA TENELLA, Petrie.

PLATE 224.—DESCHAMPSIA TENELLA.

FAMILY GRAMINEÆ.]

[GENUS DESCHAMPSIA, BEAUV.]

Deschampsia tenella, Petrie in *Trans. N.Z. Inst.* xxiii (1891), 402; *Cheesem. Man. N.Z. Fl.* 878.

The genus *Deschampsia* is represented in New Zealand by seven species; but of these, only one, the widely distributed *D. cæspitosa*, belongs to the typical division of the genus. All the rest form a group distinguished by the awn being nearly terminal and very small, or else entirely absent. Although best placed in *Deschampsia* they have relationships with *Catabrosa*, in which genus one of them was placed by Hooker, and with the South American *Achneria*. All the species constituting the group are confined to New Zealand, and have a pre-eminently montane and southern distribution. One is restricted to Macquarie Island, and two others extend as far south as the Auckland and Campbell Islands.

Deschampsia tenella, the species figured in the accompanying plate, was originally discovered by Mr. Colenso on the summit of the Ruahine Range, during his first journey thereto in 1845. Sir J. D. Hooker, in the "*Flora Novæ Zelandiæ*," considered it to be identical with a species which he had gathered in Campbell Island, and which he had described in the "*Flora Antarctica*" under the name of *Catabrosa antarctica*, and this view was accepted by Mr. Buchanan in his work on the New Zealand grasses. Mr. H. H. Travers collected the same plant on the Tararua Mountains, and a little later it was observed by Mr. McKay on Mount Arthur. In 1890 specimens obtained by Mr. Petrie in the Catlins River district were critically examined by Mr. N. E. Brown, of the Kew Herbarium, and were referred by him to the genus *Deschampsia*, a view which is also adopted by Professor Hackel.

Deschampsia tenella is probably not uncommon in mountain districts in both the North and South Islands, although its recorded habitats at the present time are but few. In the North Island it is not known below an altitude of 4,000 ft., but in the South Island it descends to sea-level near Dunedin. The Campbell Island plant with which it was united by Hooker is now known to be distinct, and bears the name of *Deschampsia Chapmani*.

PLATE 224. *Deschampsia tenella*, drawn from specimens collected by Mr. Petrie in the Catlins River district, southern Otago. Fig. 1, ligule of leaf (enlarged); 2, spikelet ($\times 9$); 3 and 4, outer glumes ($\times 9$); 5, the two flowers of the spikelet ($\times 9$); 6, flowering-glume of lower flower ($\times 12$); 7, flowering-glume of upper flower ($\times 12$); 8, palea ($\times 12$); 9, lodicules, stamens, and ovary ($\times 12$); 10, lodicules (more enlarged).



M. Smith del.
J. N. Pritch lith.

TRISETUM YOUNGII, Hook. f.

West, Newman imp.

PLATE 225.—TRISETUM YOUNGII.

FAMILY GRAMINEÆ.]

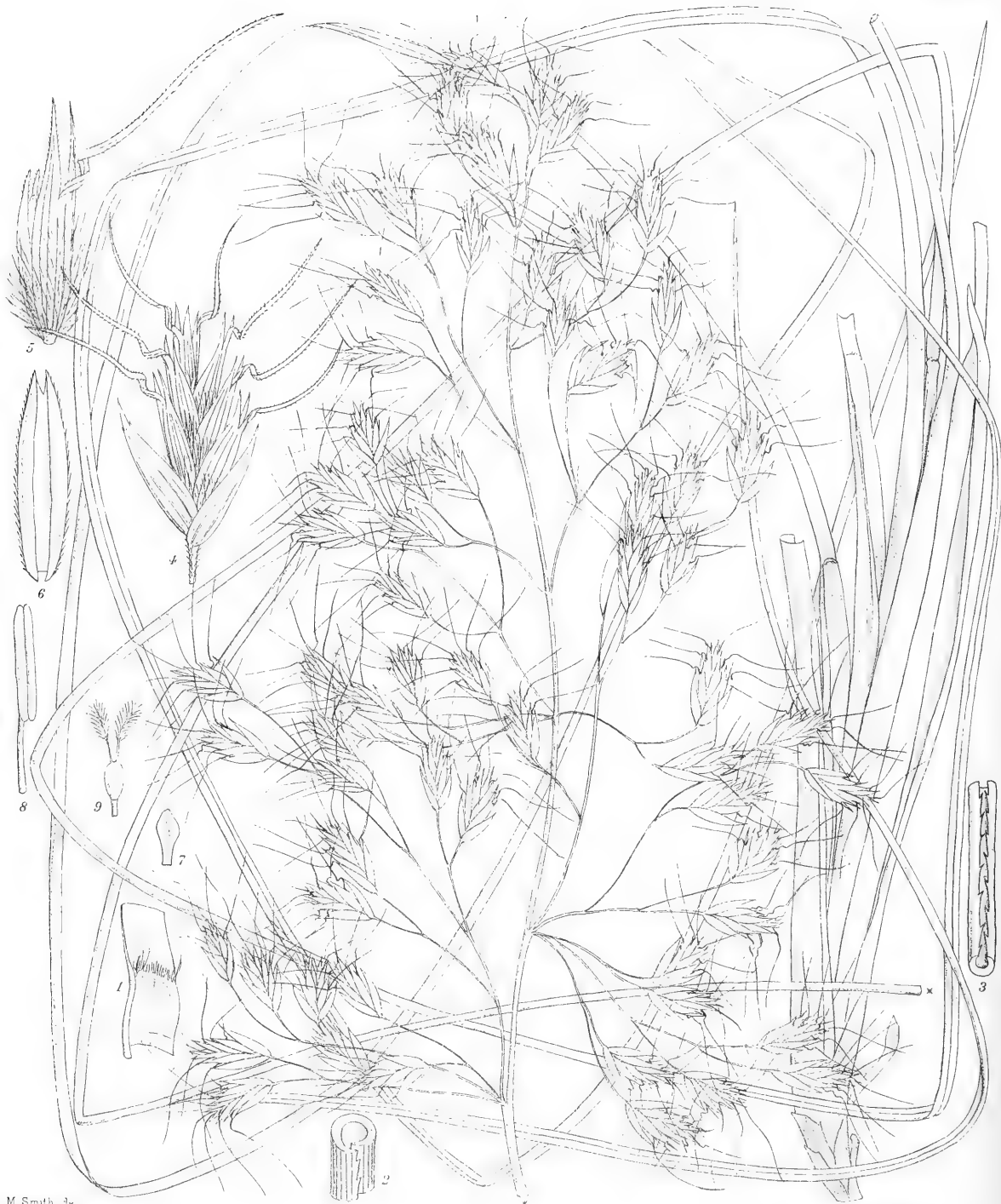
[GENUS TRISETUM, PERS.]

Trisetum Youngii, Hook. f. *Handb. N.Z. Fl.* 335; *Cheesem. Man. N.Z. Fl.* 881.

Trisetum Youngii was one of the many discoveries made by Sir Julius von Haast during his exploration of the Southern Alps of Canterbury, and was first collected in the valley of the Macaulay, the chief tributary of the Godley River, flowing into Lake Tekapo. It was named in honour of Mr. William Young, Haast's chief topographical assistant, who paid special attention to the grasses of the district visited. It was subsequently gathered by Mr. Armstrong in several other localities in the Southern Alps; and about 1878 was collected by Mr. H. H. Travers on the Tararua Mountains, in the North Island. In 1881 I found it to be abundant on the Mount Arthur Plateau, Nelson; and about the same time it was collected by Mr. Petrie in several localities in the west of the Otago Provincial District. The most northern station that I am acquainted with is at the western base of Ruapehu, where I observed it a few years ago. It is probably not uncommon in mountain districts from thence southwards as far as the south-west of Otago, but apparently has not been noticed in Stewart Island.

The nearest ally of *T. Youngii* is undoubtedly *T. antarcticum*, some forms of which approach it very closely. But it is usually a taller and much more pilose plant, with a narrower and more compact panicle, and the glumes are broader. Of the four species of *Trisetum* found in New Zealand three are endemic; the fourth (*T. subspicatum*) is found in Tasmania and Fuegia, and in Arctic Europe, Asia, and America.

PLATE 225. *Trisetum Youngii*, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an altitude of 4,000 ft. Fig. 1, tip of leaf ($\times 4$); 2, ligule of leaf ($\times 4$); 3, spikelet ($\times 8$); 4 and 5, outer glumes ($\times 8$); 6, the two flowers of the spikelet ($\times 8$); 7 and 8, two views of palea ($\times 8$); 9, lodicules and ovary ($\times 8$); 10, anther ($\times 8$).



M. Smith del.
J. N. Fitch lith.

West. Newman imp.

DANTHONIA RAOULII, Sterud.

PLATE 226.—DANTHONIA RAOULII.

FAMILY GRAMINEÆ.]

[GENUS DANTHONIA, D.C.]

Danthonia Raoulii, Steud. *Syn. Pl. Gram.* 246; Hook. f. *Handb. N.Z. Fl.* 332; Cheesem. *Man. N.Z. Fl.* 886.

As its name indicates, this well-known species was first collected by Raoul during his exploration of Banks Peninsula made in the years 1840 to 1843. On his return to Europe he described it under the name of *Danthonia rigida*, a title which was afterwards changed by Steudel to *Danthonia Raoulii*. In 1845 it was observed by Colenso on the Ruahine Range, and since then no explorer of upland districts in the southern half of the North Island and throughout the whole of the South Island has failed to notice the plant. Its northern limit appears to be on the summit of Mount Hikurangi, in the East Cape district; but it is abundant on the central volcanic plateau of the North Island, and from thence southwards on the Kaimanawa, Ruahine, and Taranaki Mountains. In the South Island it is common throughout, and it also reappears in Stewart Island.

Danthonia Raoulii, including in the term the variety *flavescens*, which some botanists prefer to regard as a distinct species, is one of the largest of the so-called "tussock" grasses, and occupies immense tracts of elevated country in the mountain districts of both the North and South Islands. In the early days of colonization it was usually called "snow-grass," doubtless from the fact that it is often the dominant species in high-lying country, covered with snow in winter-time. It now more generally bears the name of "red-tussock," and certainly has a reddish tinge when observed at close quarters, although the general colour of a *Danthonia Raoulii* meadow when seen from a little distance is a dreary and monotonous brown. The so-called "tussocks" are often of great size, frequently from 3 ft. to 4 ft., and when growing close together, and laden with a multitude of large oat-like spikelets, present an appearance not at all unlike a field of waving grain.

D. Raoulii must be regarded as possessing considerable economic importance. No doubt the foliage is hard, coarse, and stringy, and is avoided by stock when more tender and nutritious species are present. But the fact remains that it does produce herbage that can be eaten, especially when the young spring growth commences; and that, in addition, it provides shelter for the smaller and finer grasses. *Danthonia Raoulii* usually occupies country which is not at all likely to be converted into meadows of imported English grasses, and which, in point of fact, from its poor soil and bleak wind-swept character is hardly adapted for the support of a vegetation economically better than the original indigenous covering. It is much to be regretted that the injudicious practice of indiscriminate burning, now so largely followed, is gradually destroying a really useful plant, without supplying its place with anything of equal value.

PLATE 226. *Danthonia Raoulii*, drawn from specimens collected by the Broken River, Canterbury Alps, at an elevation of 3,000 ft. Fig. 1, ligule of leaf ($\times 3$); 2 and 3, portions of leaf, showing its involute character ($\times 6$); 4, spikelet ($\times 4$); 5, flowering-glume with its twisted awn, and palea ($\times 7$); 6, palea ($\times 8$); 7, lodicule; 8, anther; 9, ovary and styles. (All enlarged.)



DANTHONIA AUSTRALIS, Buch.

West, Newman imp.

M. Smith del.
J.H. Fitch lith.

PLATE 227.—DANTHONIA AUSTRALIS.

FAMILY GRAMINEÆ.]

[GENUS DANTHONIA, D.C.

Danthonia australis, *Buch. N.Z. Grasses*, t. 31; *Cheesem. Man. N.Z. Fl.* 888.

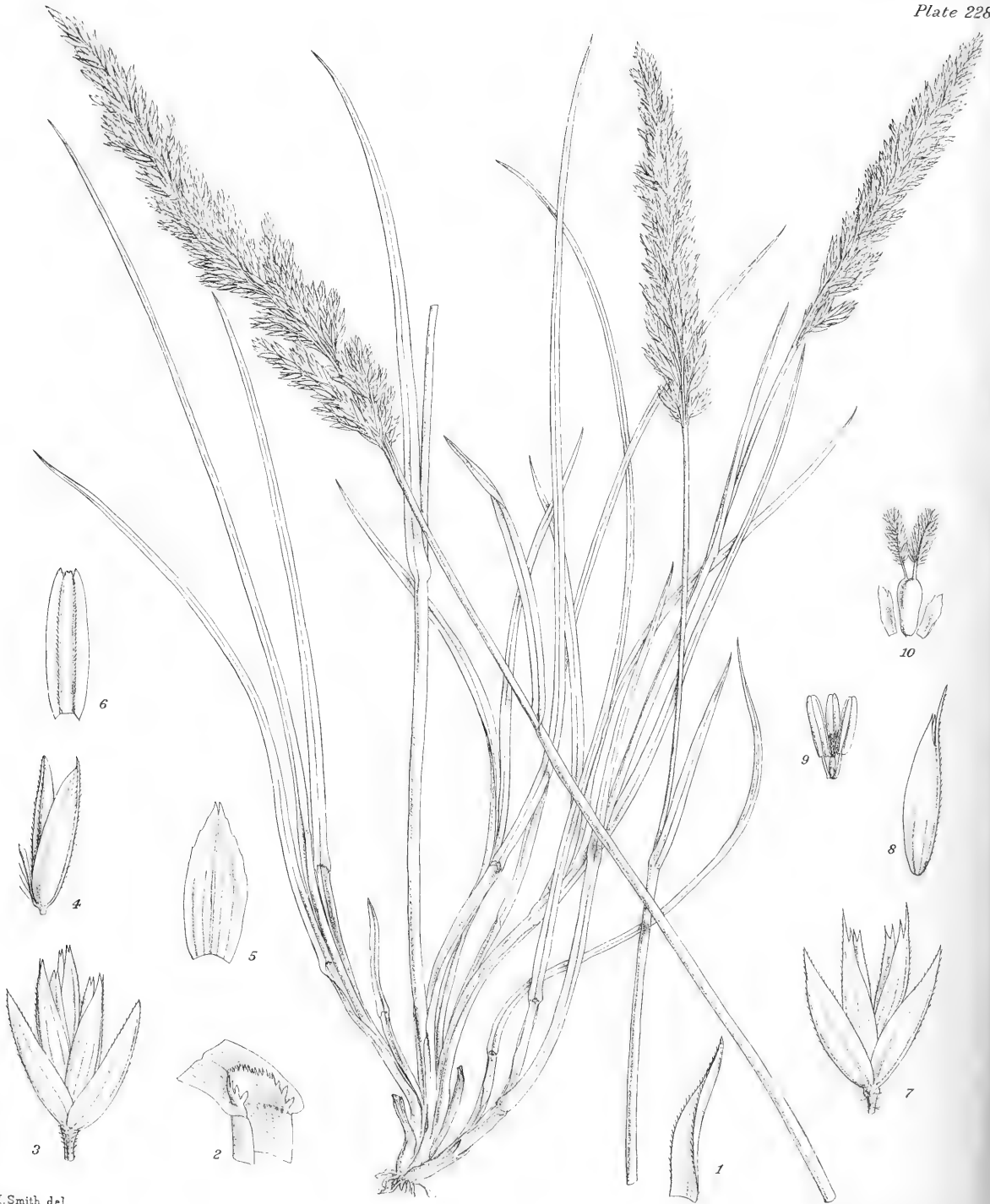
So far as I am aware, the first botanist to collect *Danthonia australis* was Mr. J. Buchanan, who obtained it on the Kaikoura Mountains in 1867. In 1871 it was observed by Mr. H. H. Travers on the mountains above Lake Guyon, in southern Nelson; and in the same year was described by Mr. Buchanan as a variety of *D. Raoultii* (*Trans. N.Z. Inst.* iv (1872), 224). Additional specimens and information soon convinced Mr. Buchanan that it was deserving of recognition as a distinct species, and it was accordingly published in his "Grasses of New Zealand" under the name it now bears.

The most northern habitat that I am acquainted with for *D. australis* is the Mount Arthur Plateau, Nelson, where I gathered it many years ago. I have also observed it in many other localities in the Nelson Provincial District, as the Dun Mountain Range, Mount Owen, the mountains flanking the Wairau Valley, and those overlooking the Clarence and Waiau Valleys. Mr. Townson found it an abundant grass on the higher slopes of the Paparoa Range, to the south of the Buller River, and I have seen specimens gathered on the Hurunui Mountains, in North Canterbury. Probably it extends still further south on the Canterbury mountains. It is most abundant between 3,000 ft. and 4,500 ft. altitude, but ascends to quite 6,000 ft. in several localities in Nelson.

In the Nelson mountains *D. australis* has received the local names of "carpet-grass" or "hassock-grass." It often covers large areas on the steep slopes of the mountains at altitudes above 4,000 ft., forming a close and dense covering of compacted stems and leaves, which usually all point downhill, especially after the melting of the snow in early summer. Hence it is not easy to cross these slopes without the chance of a slide or tumble. According to Mr. Buchanan, the lower parts of the stems and leaves, which are blanched and succulent, are much relished as food by rats.

PLATE 227. *Danthonia australis*, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an altitude of 4,000 ft. Fig. 1, tip of leaf ($\times 4$); 2, ligule of leaf ($\times 4$); 3, spikelet ($\times 3$); 4, outer glume ($\times 4$); 5, a single flower removed from the spikelet ($\times 4$); 7 and 8, different views of palea ($\times 4$); 9, lodicule ($\times 4$); 10, anther ($\times 4$); 11, ovary and styles ($\times 4$).





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

KOELERIA KURTZII, Hackel.

PLATE 228.—KÆLERIA KURTZII.

FAMILY GRAMINEÆ.]

[GENUS KÆLERIA, PERS.

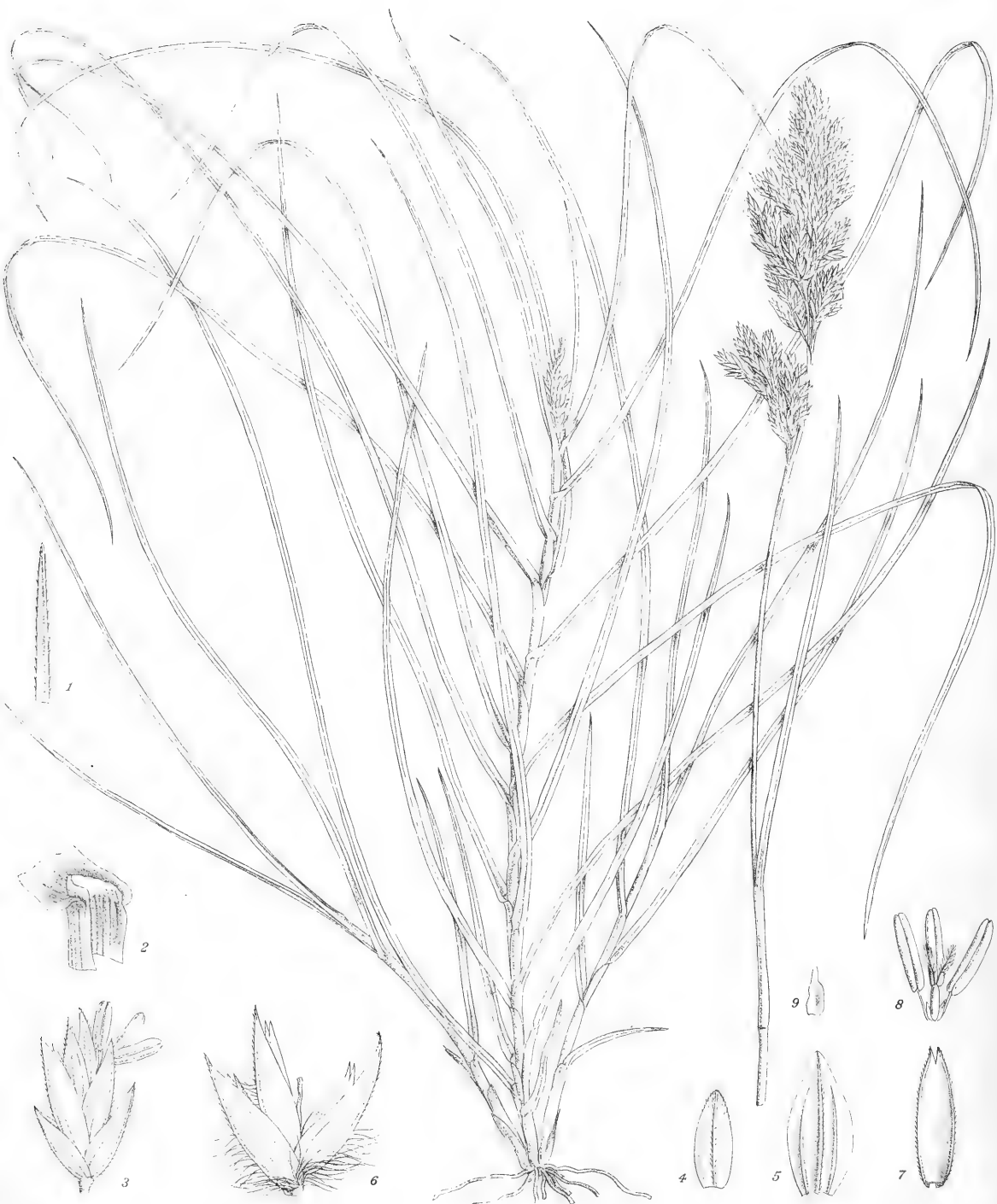
Kœleria Kurtzii, Hack. in Bolet. Acad. Sc. de Cordoba, xvi (1900), 261; Cheesem. Man. N.Z. Fl. 897.

Kœleria Kurtzii, which in this work is taken to include the whole of the *Kœleria* found in New Zealand, was first gathered by Sir David Munro on the "Aglionby Plains, near Nelson," about 1851. As the interior of the South Island and its vegetation became gradually known to Europeans *Kœleria* was found to have a fairly general distribution, and it has been recorded from most districts between Collingwood in the north and Foveaux Strait in the south. It has also been recorded by Mr. Buchanan from Miramar (near Wellington), but as it has not been collected by any other botanist I fear some mistake was made in the identification. At the same time, it is highly probable that it occurs at high elevations on the Tararua or other of the higher mountain-ranges of the North Island. In a similar manner, I can hardly doubt that it will ultimately be found in Stewart Island. It is mostly seen in hilly and mountainous localities, where it ascends to 4,500 ft. altitude, but it descends to sea-level in many stations.

In the "Flora," and again in the "Handbook," Sir J. D. Hooker referred the New Zealand forms to the northern *K. cristata*. But Professor Hackel, who did me the favour of examining a full series, has informed me that our plant differs from *K. cristata* in the minutely 2-toothed tip of the flowering-glume with a short awn on the back below the sinus, and that in *K. cristata* the flowering-glume is entire and not awned. Professor Hackel further identified our plant with the South American *K. Kurtzii*, informing me that Argentine specimens of that plant were "quite identical with the New Zealand ones." I therefore adopted Hackel's views in the Manual. In Dr. Domin's recent monograph of *Kœleria* ("Bibliotheca Botanica," heft 65) the New Zealand forms are considered to form three distinct endemic species, mainly distinguished by minute differences in the size and position of the terminal awn of the flowering-glume. These are characters which have always appeared to me to be trivial and inconstant.

Kœleria Kurtzii is not without economic value, although its yield of herbage is comparatively small. It is readily eaten by both cattle and sheep.

PLATE 228. *Kœleria Kurtzii*, drawn from specimens collected in the Hooker Valley, Mount Cook district, at an altitude of 2,500 ft. Fig. 1, tip of leaf ($\times 8$); 2, ligule of leaf ($\times 8$); 3, spikelet ($\times 6$); 4, flower, without any awn ($\times 8$); 5, flowering-glume ($\times 8$); 6, palea ($\times 8$); 7, spikelet, with awned flowers ($\times 8$); 8, flowering-glume from same ($\times 8$); 9, lodicules, stamens, and ovary ($\times 8$); 10, lodicules and ovary more highly magnified ($\times 20$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

POA POLYPHYLLA, Hackel.

PLATE 229.—POA POLYPHYLLA.

FAMILY GRAMINEÆ.]

[GENUS POA, LINN.

Poa polyphylla, Hack. in *Trans. N.Z. Inst.* xxxv (1903), 383; *Cheesem. Man. N.Z. Fl.* 903.

Poa polyphylla was originally discovered by myself in the Kermadec Islands in August, 1887, during an expedition made for the purpose of annexing the group to the Colony of New Zealand. I then found it to be abundant on cliffs on both Sunday Island and Macaulay Island; but my visit was made too early in the season to allow me to obtain good flowering specimens, although one or two old panicles of the previous year's growth enabled me to refer it to the genus *Poa*. For many years no additional specimens were obtained, but in 1900, during one of the periodical visits made to the group by the Government steamer "Hinemoa," Miss Shakespear obtained an excellent series, which she kindly placed at my disposal. From this material Professor Hackel was able to describe the species under the name already quoted. In 1908 Mr. W. R. B. Oliver spent ten months on Sunday Island for the purpose of examining its vegetation, and found the *Poa* to be abundant. He records it from "Coastal and inland rocks and cliffs, landslip (Denham Bay), Sunday Island; cliffs, Macaulay Island" (*Trans. N.Z. Inst.* vol. xlii (1910), 163).

According to my own observations in 1887, *Poa polyphylla* often forms a conspicuous portion of the vegetation on cliffs and rocky slopes on the northern side of Sunday Island, the slender drooping foliage being everywhere in evidence. The stems are often much branched, and are remarkable for the number of leaves, which are usually more or less distichously arranged. As for the relationships of the species, Professor Hackel considers it to be an ally of *P. anceps*, from which, however, it totally differs in habit. In the Manual I have placed it next to *P. ramosissima*.

PLATE 229. *Poa polyphylla*, drawn from specimens collected on seaciffs on Sunday Island, Kermadec Group. Fig. 1, tip of leaf ($\times 8$); 2, ligule of leaf ($\times 8$); 3, four-flowered spikelet ($\times 6$); 4 and 5, empty glumes ($\times 8$); 6, three-flowered spikelet, with the empty glumes removed ($\times 8$); 7, palea ($\times 8$); 8, lodicules, stamens, and ovary ($\times 8$); 9, lodicule more highly magnified ($\times 20$).



M. Smith del.
J.N. Patch lith.

West, Newman imp

POA DIPSACEA, Petrie.

PLATE 230.—POA DIPSACEA.

FAMILY GRAMINEÆ.]

[GENUS POA, LINN.

Poa dipsacea, Petrie in *Trans. N.Z. Inst.* xxvi (1891), 271 ; *Cheesem. Man. N.Z. Fl.* 906.

Mr. D. Petrie, who in 1893 collected specimens of this handsome grass near the sources of the Broken River, in the Canterbury Alps, was the first to recognize its distinctness as a species, and to describe it under the name which it still bears. Ten years before, however, it had been gathered in the same district by Mr. T. Kirk and Mr. J. D. Enys, and a few years later by myself. I have also observed it in ravines on the Raglan Mountains, Nelson ; and Mr. Townson has sent me specimens collected on Boundary Peak, the northern termination of the Brunner Range, Buller Valley. Dr. Cockayne has also observed it on the Craigieburn Mountains and elsewhere in the Canterbury Alps. Probably it is not uncommon in moist ravines in the central chain of the Southern Alps from the Wairau Gorge southwards to the middle or south of Canterbury. Its altitudinal range is from 3,000 ft. to 5,000 ft.

P. dipsacea is usually found in crevices of rock by the sides of streams, or occasionally in wet gravel in similar localities, but in all cases in situations where it can obtain a constant supply of moisture with free drainage. In such places it often exhibits much luxuriance of growth, producing great masses of soft pale-green foliage. I am not aware that it possesses any economic value ; but it is rarely seen in sufficient quantity to be of much importance.

As a species *Poa dipsacea* is closely allied to Berggren's *Poa pusilla*, from which, however, it is readily separated by the larger size, flatter leaves, much larger spikelets, and by the much more acute flowering-glumes, which have more scabrid nerves. It should be remarked that Berggren's *P. pusilla* was founded on depauperated specimens, and that the usual state of the species is larger than that described and figured by him.

PLATE 230. *Poa dipsacea*, drawn from specimens collected by the Broken River, Canterbury Alps, at an elevation of 3,500 ft. Fig. 1, ligule of leaf ($\times 4$) ; 2, spikelet ($\times 4$) ; 3, outer glume ($\times 6$) ; 4, inner glume ($\times 6$) ; 5, flowering-glume and palea ($\times 6$) ; 6, flowering-glume ($\times 6$) ; 7, palea ($\times 6$) ; 8, lodicules and ovary ($\times 6$) ; 9, a single lodicule more highly magnified ($\times 12$) ; 10, anther ($\times 6$).





M. Smith del.
J.N. Fitch lith.

West, Newman imp.

POA CHEESEMANII, Hackel.

PLATE 231.—POA CHEESEMANII.

FAMILY GRAMINEÆ.]

[GENUS POA, LINN.

Poa Cheesemanii, Hack. in *Trans. N.Z. Inst.* xxxv (1903), 383; *Cheesem. Man. N.Z. Fl.* 906.

Poa Cheesemanii was first collected by myself in January, 1893, at Lake Tennyson, a picturesque sheet of water concealed in the heart of the Spenser Mountains, and the source of the well-known Clarence River. At the time of my visit a considerable stretch of peaty and boggy soil near the lower end of the lake had been temporarily protected from stock through the construction of a rabbit-fence, and was occupied by an abundant growth of indigenous grasses, amongst which *Hierochloa Fraseri*, *Agrostis Dyeri*, *Kaeria Kurtzii*, *Poa Kirkii*, and the present species were conspicuous. But I did not notice the plant in any other locality in the district; and, so far as I am aware, it has not been found elsewhere on the eastern side of the central chain of the Southern Alps. Mr. Townson, however, has supplied me with specimens collected on the pakihi country to the south of Westport; and I can entertain no doubt that with proper search it will be observed in other stations on the mountains of Nelson and North Canterbury.

P. Cheesemanii was first distinguished as a species by Professor Hackel in 1903. He compared it with the abundant and widely distributed *P. anceps*; remarking, however, that it can be separated from all the forms of that plant by its stoloniferous rhizome, the rhizome of *P. anceps* being invariably tufted. *P. Cheesemanii* also differs widely in habit and appearance, so that there is no fear of the two plants being confounded.

The general aspect of *P. Cheesemanii* leads to the belief that it may possess some value as a pasture-grass, but I have no evidence as to how far it is relished by stock.

PLATE 231. *Poa Cheesemanii*, drawn from specimens collected at Lake Tennyson, Nelson, at an altitude of 3,500 ft. Fig. 1, ligule of leaf ($\times 4$); 2, spikelet ($\times 4$); 3, outer glume ($\times 6$); 4, inner glume ($\times 6$); 5, flowering-glume and palea ($\times 6$); 6, terminal flower of spikelet ($\times 6$); 7, flowering-glume ($\times 6$); 8, palea ($\times 6$); 9, lodicules ($\times 12$); 10, anther ($\times 6$); 11, ovary and styles ($\times 6$); 12, grain ($\times 6$).



M. Smith del.
J. N. Fitch lith.

West Newman imp

POA KIRKII, Buch.

PLATE 232.—POA KIRKII.

FAMILY GRAMINEÆ.]

[GENUS POA, LINN.

Poa Kirkii, Buch. N.Z. Grasses, t. 51b; Cheesem. Man. N.Z. Fl. 910.

P. Kirkii is so widely distributed in upland districts that it must have come under the observation of the early runholders in the mountainous centre of the South Island; but it does not seem to have been noticed by any botanist until 1875, when it was collected by Mr. T. Kirk in the upper part of the Clarence Valley, in southern Nelson. Mr. Kirk gave it the MS. name of *Poa purpurea*, but published no description; so that Mr. Buchanan, when figuring the plant in his "Grasses of New Zealand," substituted the name under which it is now known. Attention once having been called to the plant, it was soon observed in many localities in both the North and South Islands, and is now known to be abundant in subalpine localities from Mount Egmont and the Tararua Mountains southwards to Foveaux Strait. It has not yet been recorded from Stewart Island, but it probably exists thereon. It is most plentiful at altitudes between 3,000 ft. and 4,000 ft., but ascends to 5,000 ft., and descends to 2,000 ft., or perhaps lower.

P. Kirkii is an exceedingly variable plant, and variable in the true sense of the term, the varieties being connected by a regular chain of intermediate forms. In the Manual I have included within its circumscription the *P. Mackayi* of Buchanan, and the *P. Collinsii* of Kirk. The first of these differs in its taller and stouter habit, broader leaves, larger spikelets, and in the flowering-glumes often having crisped hairs at the base, whereas they are usually glabrous in typical *P. Kirkii*. But all these characters are inconstant; and on the Mount Arthur Plateau, Nelson, I was able to trace a regular series of passage forms from the typical state of *P. Mackayi* into that of *P. Kirkii*. *P. Collinsii* recedes in its taller and more slender habit, fewer stem-leaves, and in the longer and laxer panicle; but it, too, is connected by intermediate states.

P. Kirkii is generally admitted to be a grass of considerable economic importance, and is readily eaten by stock of all kinds. It is probably well suited for sowing in cool upland localities, and should receive an extended trial in the experimental agricultural stations of the Dominion.

PLATE 232. *Poa Kirkii*, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an altitude of 4,000 ft. Fig. 1, ligule of leaf ($\times 4$); 2, spikelet ($\times 4$); 3, outer glume ($\times 6$); 4, inner glume ($\times 6$); 5, flowering-glume and palea ($\times 6$); 6, terminal flower ($\times 6$); 7, lodicules, stamens, and ovary ($\times 8$).



M. Smith del.
J. N. Fitch lith

West, Newman imp

FESTUCA OVINA, var. *NOVAE-ZEALANDIAE*, *Haelet.*

PLATE 233.—*FESTUCA OVINA*, var. *NOVÆ-ZEALANDIÆ*.

FAMILY GRAMINEÆ.]

[GENUS *FESTUCA*, LINN.

Festuca ovina, Linn., var. *novæ-zealandiæ*, Hack. in *Trans. N.Z. Inst.* xxxv (1903), 384 ;
Cheesem. Man. N.Z. Fl. 917.

In the "Flora Novæ Zelandiæ," and again in the "Handbook," Sir J. D. Hooker united under the name of *Festuca duriuscula* all the New Zealand *Festucæ* which partook of the characters of *F. ovina*, *F. duriuscula*, and *F. rubra*, and for many years this view was followed by New Zealand botanists. In 1903, however, the well-known agrostologist, Professor E. Hackel, after a careful study of a large series of specimens, came to the conclusion that the true *F. duriuscula* did not exist in an indigenous state in New Zealand, and that the majority of Hooker's *Festucæ* were referable to *F. rubra*. Two varieties, however, he placed under *F. ovina*, one of them being the subject of this plate.

F. ovina differs from *F. rubra* in not possessing creeping stolons, in the innovation-shoots being intravaginal, and in the ligules being biauricled. The variety *novæ-zealandiæ*, figured herewith, is separated from the type by the peculiar tussocky habit, more scabrid leaves, and by the rather larger spikelets. Professor Hackel states that its nearest ally is the European variety *Beckeri*, which is unknown to me.

My specimens of var. *novæ-zealandiæ* were gathered many years ago on Mount Torlesse, in Canterbury, where it was not uncommon at an elevation of about 3,000 ft. I have also seen it in the Clarence Valley, and I have specimens collected by Mr. Petrie in several localities in Central Otago. It is quite possible that it may have a wide range in mountain districts, for it is by no means easy to distinguish it, without close examination, from tussocky forms of *F. rubra*.

PLATE 233. *Festuca ovina*, var. *novæ-zealandiæ*, drawn from specimens collected on Mount Torlesse, Canterbury, at an altitude of 3,000 ft. Fig. 1, ligule of leaf ($\times 4$); 2, spikelet ($\times 4$); 3, spikelet spread out ($\times 4$); 4, outer glume ($\times 6$); 5, inner glume ($\times 6$); 6, flower ($\times 6$); 7, flowering-glume ($\times 6$); 8, palea ($\times 6$); 9, lodicules ($\times 8$); 10, anther ($\times 8$); 11, ovary and styles ($\times 8$).



M. Smith del.
J. N. Fitch lith.

AGROPYRUM ARISTATUM, *Cheesem.*

West, Newman imp.

PLATE 234.—AGROPYRUM ARISTATUM.

FAMILY GRAMINEÆ.]

[GENUS AGROPYRUM, GAERTN.

Agropyrum aristatum, *Cheesem.*

A. Enysii, *T. Kirk in Trans. N.Z. Inst.* xxvii (1895), 352; *Cheesem. Man. N.Z. Fl.* 922.

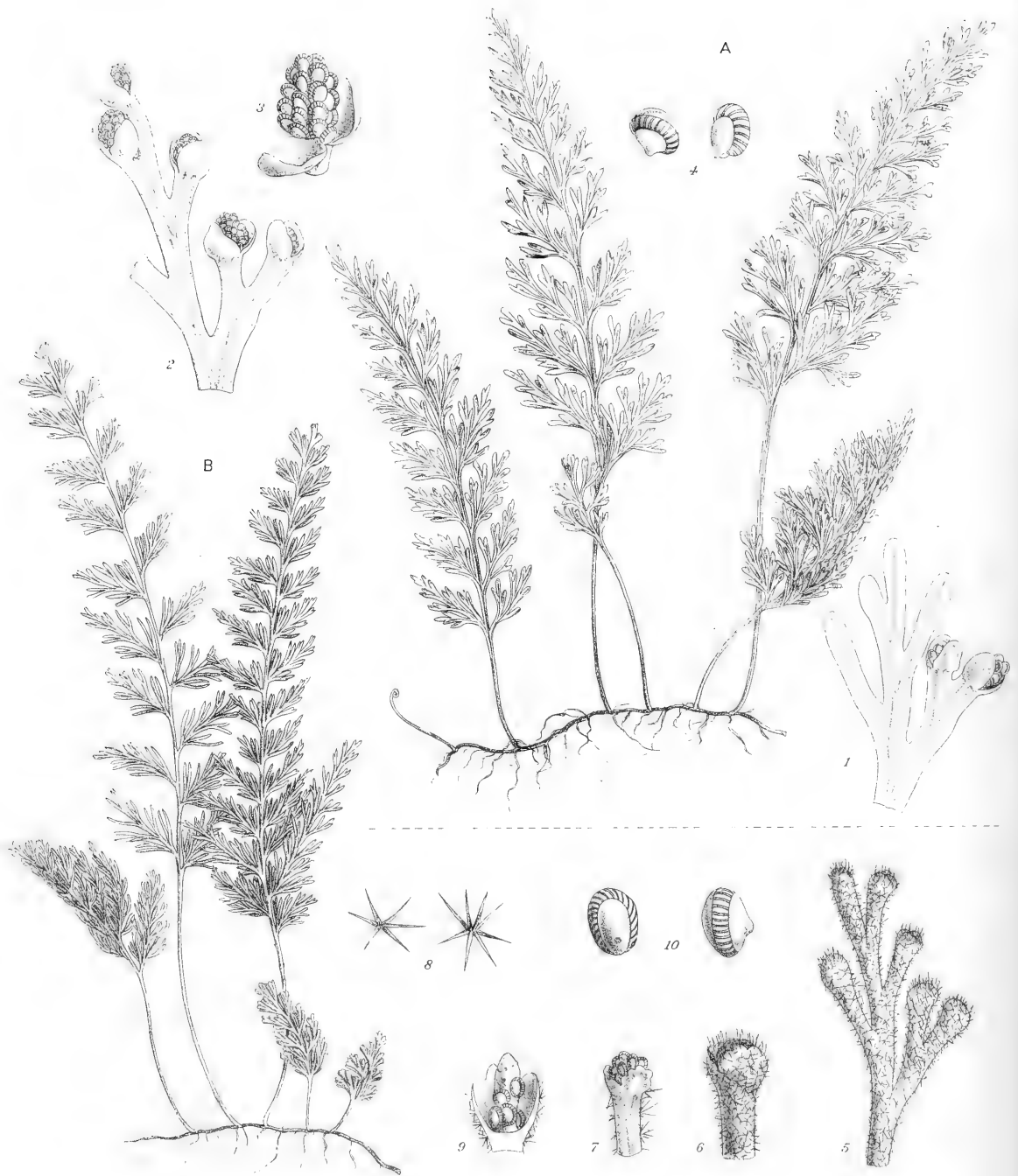
Asperella aristata, *Petrie in Trans. N.Z. Inst.* xxvi (1894), 272.

This curious species of *Agropyrum* was originally discovered by Mr. J. D. Enys in the Broken River district, Canterbury Alps, in the year 1877; and specimens were communicated to Mr. T. Kirk and myself. A few years later Mr. N. Y. Carrington collected it in some locality in the Upper Waimakariri district, and about the same time Mr. Kirk gathered it in the Bealey Gorge. In 1883, under the guidance of Mr. Enys, I observed it on the western slopes of Mount Torlesse, and in 1893 Mr. Petrie collected it in the same district. Finally, Dr. Cockayne obtained specimens in the valley of the Poulter River in 1898. All the above localities lie in the middle and upper part of the basin of the Waimakariri River, and up to the present time the plant has not been found outside that district. Its altitudinal range is between 2,500 ft. and 4,500 ft.

Agropyrum aristatum was first published by Mr. D. Petrie as a species of *Asperella*. No doubt he was influenced by the great resemblance which the plant bears to *Asperella gracilis*, but in all essential characters the plant is a true *Agropyrum*. Recognizing this fact, Mr. Kirk removed it to that genus; and, desiring to commemorate the botanical services of its discoverer, proposed that it should bear the name of *Agropyrum Enysii*. This name I adopted in the Manual; but, the Vienna Conference having made it obligatory to use the earliest specific name, I am now compelled to revert to the designation first given by Mr. Petrie.

Agropyrum aristatum is a very distinct species, not at all closely allied to any other. It differs from all the other New Zealand representatives of the genus in the few-flowered spikelets, to say nothing of the flat membranous leaves and slender spike. It is much too scarce and local to have any economic value.

PLATE 234. *Agropyrum aristatum*, drawn from specimens collected near the Broken River, Canterbury Alps. Fig. 1, ligule of leaf ($\times 3$); 2, a pair of spikelets ($\times 3$); 3, outer glume ($\times 5$); 4, flower ($\times 5$); 5, flowering-glume ($\times 5$); 6, palea ($\times 5$); 7, lodicules, stamens, and ovary ($\times 7$); 8, single lodicule ($\times 10$); 9, ovary and styles ($\times 10$).



A. Smith del.
J. Fitch lith.

West, Newman imp.

A. HYMENOPHYLLUM ATROVIRENS, Col. 1-4.
B. HYMENOPHYLLUM MALINGII, Metten. 5-10.

PLATE 235.—HYMENOPHYLLUM ATROVIRENS AND
HYMENOPHYLLUM MALINGII.

FAMILY FILICES.]

[GENUS HYMENOPHYLLUM, LINN.

Hymenophyllum atrovirens, Col. in *Tasm. Journ. Nat. Sci.* (1846) 186; *Cheesem. Man. N.Z. Fl.* 933.

Hymenophyllum Malingii, Metten. ex Hook. and Bak. *Syn. Fil.* 66; *Cheesem. Man. N.Z. Fl.* 938.

Trichomanes Malingii, Hook. *Garden Ferns*, t. 64; Hook. f. *Handb. N.Z. Fl.* 357.

Hymenophyllum atrovirens was first discovered by Mr. Colenso in December, 1841, growing "on rocks and stones, in low places and watercourses, in wet woods, shores of Waikare Lake," and was published by him in 1846 in the "Tasmanian Journal of Natural Science," vol. 2. Sir J. D. Hooker, in the "Flora," referred it to the well-known *H. crispatum* (now known as *H. australe*), an identification which was accepted by most botanists. In 1877, however, Mr. Kirk, who does not appear to have been acquainted with the true *H. atrovirens*, described a form of it with toothed involucre, collected on the mountains at the head of Lake Wakatipu by Mrs. Mason, as a distinct species under the name of *H. montanum*. In 1885 Mr. J. Stewart, C.E., collected the typical state of *H. atrovirens* in deep ravines near Mamaku, on the Rotorua Railway; and about the same time it was observed at Waimate North by Miss Clarke, and by myself at Whangarei. It has also been gathered by Mr. Kingsley in north-west Nelson.

H. atrovirens differs from *H. australe* in the much smaller and narrower frond, with much fewer divisions; in the flat (not crisped) wings of the stipes and rhachis; and in the narrower segments and smaller narrower involucre. Mr. Kirk's *H. montanum* only differs in the toothed involucre, and has no claim to specific rank.

Hymenophyllum Malingii is one of the most peculiar species of the genus, and can always be recognized by the pale-brown or reddish-brown stellate indumentum, which covers all the parts of the plant. It was first found by Mr. Maling on the mountains of north-west Nelson, but has since been gathered in subalpine forests in various parts of the Dominion, between Te Aroha Mountain in the North Island and the south of Otago. It is nowhere more plentiful than in the wooded portions of the volcanic plateau to the west of Tongariro and Ruapehu, where it is chiefly found on the trunks of dead trees of *Libocedrus Bidwillii*. In the South Island it is also found on *Phyllocladus alpinus* and *Podocarpus Hallii*.

PLATE 235A. *Hymenophyllum atrovirens*, drawn from specimens collected by Mr. J. Stewart in deep wooded ravines near Mamaku, Rotorua Railway. Fig. 1, portion of frond ($\times 5$); 2, another portion with numerous involucre ($\times 5$); 3, indusium laid open ($\times 10$); 4, two sporangia (greatly enlarged).

PLATE 235B. *Hymenophyllum Malingii*, drawn from specimens gathered in the Waimarino Forest; altitude 2,500 ft. Fig. 5, portion of frond ($\times 5$); 6, tip of pinnule, with indusium ($\times 10$); 7, the same with most of the stellate hairs removed ($\times 10$); 8, stellate hairs (greatly enlarged); 9, section of indusium (enlarged); 10, two sporangia (enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp

A. *TRICHOMANES LYALLII*, Hook. 1-4.
B. *TRICHOMANES COLENSOI*, Hook. f. 5-7.

PLATE 236.—TRICHOMANES LYALLII AND TRICHOMANES
COLENSOI.

FAMILY FILICES.]

[GENUS TRICHOMANES, LINN.

Trichomanes Lyallii, Hook. and Bak. Syn. Fil. 77; Cheesem. Man. N.Z. Fl. 943.

Hymenophyllum Lyallii, Hook. f. Fl. Nov. Zel. ii, 16.

Trichomanes Colensoi, Hook. f. Ic. Plant. t. 979; Cheesem. Man. N.Z. Fl. 945.

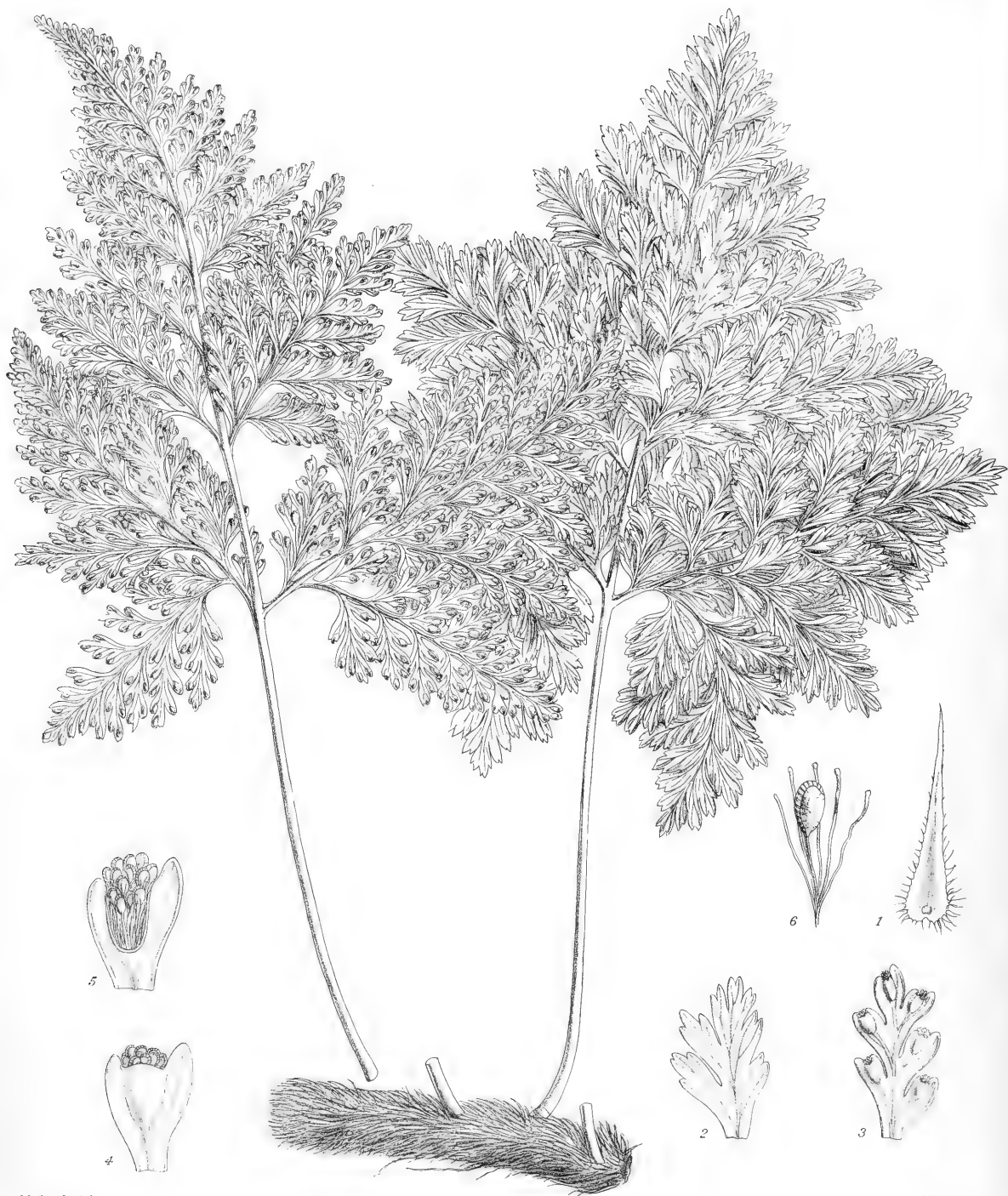
The first of the two species figured on this plate is a delicately beautiful little plant, and is worthily named after its discoverer, Dr. Lyall, who did so much in the botanical exploration of the southern coasts of New Zealand. It was first collected in Thomson's Sound, on the south-west coast of Otago, but has since been found in dense moist forests in many localities between the Northern Wairoa and Whangarei southwards to Stewart Island. In many of the deep ravines of the Thames, Waitakarei, Hunua, and other hilly districts in the Auckland Province it covers the trunks of tree-ferns with sheets of pendulous diaphanous fronds, of a glistening pale-green colour. On the east coast of the South Island it is either rare or altogether absent; but it is plentiful on the western side of the island from Collingwood southward.

Trichomanes Lyallii was originally described as a *Hymenophyllum*, and it is really solely a matter of personal idiosyncrasy as to whether it should be referred to that genus or to *Trichomanes*, the structure of the involucre being quite intermediate.

Trichomanes Colensoi, as its name indicates, was one of the many discoveries of Mr. Colenso, and was first gathered by him in January, 1842, in the dense forests surrounding Lake Waikare-moana. In 1860, or thereabouts, it was found by Mr. W. T. L. Travers in densely wooded ravines at Collingwood, Nelson; and shortly afterwards by Sir Julius von Haast at Lake Wanaka. In 1885 it was discovered by Mr. J. Stewart in deep gorges near Mamaku, on the Rotorua Railway, the most northern locality yet recorded. It has since been noted in several other widely separated stations, but always in small quantity, and invariably in deep wooded ravines or gorges. On the whole, it must be regarded as a rare and local species. It is usually found pendulous from rocks or trees by the side of streams, or on wet rocks by waterfalls, and often grows intermixed with mosses or *Hepaticæ*.

PLATE 236A. *Trichomanes Lyallii*, drawn from specimens collected by Mr. W. T. Brame at Kumara, Westland. Fig. 1, fertile pinnule ($\times 4$); 2, tip of segment, with one face of the indusium removed, showing the sporangia ($\times 6$); 3, the same with the sporangia removed ($\times 6$); 4, a single sporangium (enlarged).

PLATE 236B. *Trichomanes Colensoi*, drawn from specimens collected by Mr. J. Stewart in wooded ravines near Mamaku, Rotorua Railway. Fig. 5, segment of a pinnule, with an indusium at its base ($\times 6$); 6, section of indusium ($\times 9$); 7, two sporangia (enlarged).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

DAVALLIA TASMANI, Cheesem.

PLATE 237.—DAVALLIA TASMANI.

FAMILY FILICES.]

[GENUS DAVALLIA, SMITH.

Davallia Tasmani, *Cheesem. in Trans. N.Z. Inst.* xxiii (1891), 416; *Cheesem. Man. N.Z. Fl.* 955.

Davallia Tasmani has a very restricted geographical range, being confined to the Three Kings Islands, a small group situated about thirty-three miles to the north of Cape Maria van Diemen. In August, 1887, I gathered it on the Great King, the chief island of the group, finding it fairly abundant; and on a second visit made in 1889 I observed it in even greater quantity on the seldom visited Western King. No doubt it also exists on the Eastern King, the summit of which is covered with a dense vegetation which has not yet been examined by any botanist; but so far it has been found impossible to scale the cliffs which everywhere surround the island. Its apparent absence from any part of the North Cape Peninsula is somewhat curious; but it must be borne in mind that there are at least five other species which are endemic in the group—*Pittosporum Fairchildi*, *Alectryon grandis*, *Coprosma macrocarpa*, *Veronica insularis*, and *Paratrophis Smithii*. Their existence, together with other peculiarities of the flora, give rise to the belief, which is supported by evidence drawn from the geological and physical structure of the islands, that the group has been isolated from New Zealand proper for a considerable period of time; long enough, in fact, to allow of the gradual development of endemic forms.

Davallia Tasmani is usually found in the shade of the *Leptospermum* or other scrub which covers the greater part of the islands, and is often mixed with *Asplenium lucidum*, *Hypolepis tenuifolia*, and *Pteris comans*, together with *Poa anceps*, *Oplismenus*, and other grasses and sedges. In habit and general appearance it is widely different from any New Zealand fern; but its stiff leathery fronds and stout chaffy rhizome are not unlike those of the Polynesian *D. solida*. According to Mr. Baker, its nearest relative is the Canary Island and Madeiran *D. canariensis*. But it is much stouter than that plant, and much more finely cut; and must be regarded as a distinct species, with no very close allies.

PLATE 237. *Davallia Tasmani*, drawn from specimens gathered on the Three Kings Islands. Fig. 1, scale from the rhizome; 2, tip of barren pinnule; 3, tip of fertile pinnule; 4, tip of segment, showing a sorus and its indusium; 5, longitudinal section of the same; 6, a single sporangium with hairs. (All enlarged.)



M. Smith del
J. N. Fitch lith

LINDSAYA VIRIDIS, Col.

West, Newman imp.

PLATE 238.—LINDSAYA VIRIDIS.

FAMILY FILICES.]

[GENUS LINDSAYA, DRYANDER

Lindsaya viridis, Col. in *Tasm. Journ. Nat. Sci.* ii (1846), 174; *Cheesem. Man. N.Z. Fl.* 959.

Lindsaya viridis, which is a very beautiful and distinct species, was originally discovered by Mr. Colenso in January, 1842, while journeying from Rotorua to Tauranga. It was gathered "on the stony banks of the Mangarewa, a small river running in a deep ravine," and was at once recognized by him as a "truly elegant species, evidently possessing some affinity with *L. trichomanoides*, from which, however, it is very distinct." Mr. Colenso published the species in the "Tasmanian Journal of Natural Science"; but in the "Flora" Sir J. D. Hooker reduced it to *L. trichomanoides*, not even granting it varietal distinction. This is a good illustration of how difficult it is to deal with plants from dried specimens alone, for there can be no doubt whatever that if Hooker had seen the plant in the living state he would never have associated it with any other species. In the "Synopsis Filicum" Mr. Baker referred it to the Australian *L. microphylla*, and no doubt that species is a much closer ally than *L. trichomanoides*, but even in that case the differences are too great to admit of specific union. In 1875 the late Mr. H. C. Field, well known from his valuable little book on New Zealand ferns, wrote to Mr. Baker forwarding specimens of the plant, and pointing out its distinctness. From this information Mr. Baker re-established Colenso's species.

L. viridis is far from common, although it has a fairly extensive range, being found from the Great and Little Barrier Islands southwards to the Sounds of south-west Otago. In the South Island, however, it is confined to the western side of the island. It is invariably found by the sides of streams, either pendulous from the wet rocks of waterfalls or dripping cliffs, or growing erect on the mossy surface of shelving rocks flanking swiftly flowing streams, in either case its roots being provided with an ample supply of moisture. But, as Mr. Field has remarked, it often grows in situations where it is exposed to full sunshine for a large part of the day. When seen massed together in quantity its pale-green fronds and remarkably elegant mode of growth give it a very attractive appearance.

PLATE 238. *Lindsaya viridis*, drawn from specimens collected in the Waitakerei Ranges, near Auckland. Fig. 1, tip of a pinnule; 2, tip of a single segment, showing a sorus with its indusium; 3, the same with one face of the indusium removed; 4, a single sporangium. (All enlarged.)



M. Smith del.
J.M. Fitch lith.

West, Newman imp.

PTERIS SCABERULA, A. Rich.

PLATE 239.—PTERIS SCABERULA.

FAMILY FILICES.]

[GENUS PTERIS, LINN.

Pteris scaberula, A. Rich. Fl. Nouv. Zel. 82, t. 11; Cheesem. Man. N.Z. Fl. 971.

The discovery of *Pteris scaberula* dates from Cook's first visit to New Zealand in 1769-70, when it was gathered by Banks and Solander in Admiralty Bay, immediately to the east of D'Urville Island, in Cook Strait. It was well described and figured by Solander, but as his name was never actually published there is no object in quoting it here. In 1826 it was collected by Allan Cunningham in "dry woods at Whangaroa," and in the following year it was obtained by D'Urville, of the French exploring-ship "L'Astrolabe," in some locality not specified. The collections made during this voyage were worked up by the eminent French botanist A. Richard in his "Flore de la Nouvelle Zélande," published in 1832, when our plant was described and figured under the name it still bears.

Since the time of Cunningham and D'Urville *Pteris scaberula* has been collected in almost all the forest districts of the Dominion, from the North Cape to Foveaux Strait and Stewart Island. It is also not uncommon on the Chatham Islands. In fact, it can be roundly said that there is no forest of any size, at a moderate elevation, where it does not occur. Under natural conditions it is a plant of dry banks and old land-slides, or of open sunny glades in the forest. But in the North Island it has spread of late years to a great extent along the sides of road-cuttings or in abandoned bush-clearings. When the Waitakare district, near Auckland, was opened up for settlement many years ago every side-cutting along the roads was at once occupied by young plants of *Pteris scaberula*, although the species was by no means generally distributed prior to the construction of the roads. The increase of certain ferns, or change in their habitats, due to man's interference with the original vegetation, has not had the attention given to it that it deserves. Putting on one side the well-known instance of the spread of *Pteris esculenta*, it is noticeable how readily *Cyathea medullaris* takes possession of steep slopes and gullies in partially denuded timber areas. *Hypolepis tenuifolia* often increases in abandoned bush-clearings, or by neglected bush-roads. *Doodia media* is becoming quite a common plant at the base of white-thorn hedges near Auckland. And *Polypodium serpens* may be seen in quantity on the rough stone walls so often built on the lava-streams of the Auckland Isthmus, and also grows in abundance on the oaks and pines and other trees of our plantations.

Pteris scaberula is often placed in the genus *Pæsia*, a small group of seven species split off from the genus *Pteris* as understood by Sir W. J. Hooker in the "Species Filicum," and by Mr. Baker in the "Synopsis Filicum." But the classification of ferns is admittedly in a very unsettled state, and in this and other instances I prefer to wait until pteridologists generally have arrived at an agreement as to the limits and characters of the various genera constituting the family.

PLATE 239. *Pteris scaberula*, drawn from specimens collected at Hunua, near Auckland. Fig. 1, portion of rhizome, with scales; 2, one of the scales or hairs; 3, pinnule; 4, barren segment; 5, young fertile segment, the indusium covering the sorus; 6, mature fertile segment; 7, section of fertile segment, with sorus and indusium; 8, a single sporangium. (All enlarged.)



M. Smith del.
J. N. Fitch lith.

LOMARIA DURA, Moore.

West, Newman imp.

PLATE 240.—LOMARIA DURA.

FAMILY FILICES.]

[GENUS LOMARIA, WILLD.

Lomaria dura, Moore in *Gard. Chron.* (1866) 290; *Cheesem. Man. N.Z. Fl.* 978.

Lomaria dura was first described by Mr. Moore in the "Gardeners' Chronicle" for 1866, his description (which I have not seen) being based on cultivated specimens originally obtained on the Chatham Islands. It does not seem to have been collected during Mr. H. H. Travers's first visit to the Chathams, made in 1863, but was gathered by him in 1871. I have also received specimens from the same locality collected by Miss Seddon and Mr. Chudleigh, both of whom informed me that the plant was abundant on cliffs. It was first recorded from the mainland of New Zealand by Mr. T. Kirk in 1878, who quoted the habitats of the Bluff Hill, Catlin's River, and the west coast Sounds. Since then it has been observed in many localities on the coast-line to the south of Banks Peninsula, and has been ascertained to be of frequent occurrence all round the shores of Stewart Island. Lastly, in 1891 Mr. T. Kirk proved that it was abundant on the islands to the south of New Zealand, a discovery which makes it probable that the *L. lanceolata* of the "Flora Antaretica" was in reality identical with *L. dura*, in which case Sir J. D. Hooker must be counted as the original discoverer of the plant.

L. dura is a purely maritime plant, and is never found far from the influence of the sea-spray. In this respect it agrees with its congener *L. Banksii*, which, however, has a much more northern distribution, advancing as far as the North Cape, whereas *L. dura* has not been found to the north of Banks Peninsula. Both species prefer crevices in rocks or the faces of cliffs, but I have seen *L. Banksii* on peaty ledges only a few feet above the limit of the tide; and Mr. Kirk states that in Stewart Island *L. dura* "frequently forms a dense fringe just above high-water mark." *L. dura* can easily be distinguished from *L. Banksii* by the larger size, broader fronds, and much longer and proportionately narrower usually acute pinnæ. Both species are endemic.

PLATE 240. *Lomaria dura*, drawn from specimens gathered by Miss Seddon on the Chatham Islands. Fig. 1, scales from the rhizome; 2 and 3, front and back of the tip of a fertile pinna; 4, cross-section of fertile pinna; 5, a single sporangium. (All enlarged.)



M. Smith. del.
J. N. Pritch. lith.

LOMARIA NIGRA, Col.

West, Newman imp.

PLATE 241.—LOMARIA NIGRA.

FAMILY FILICES.]

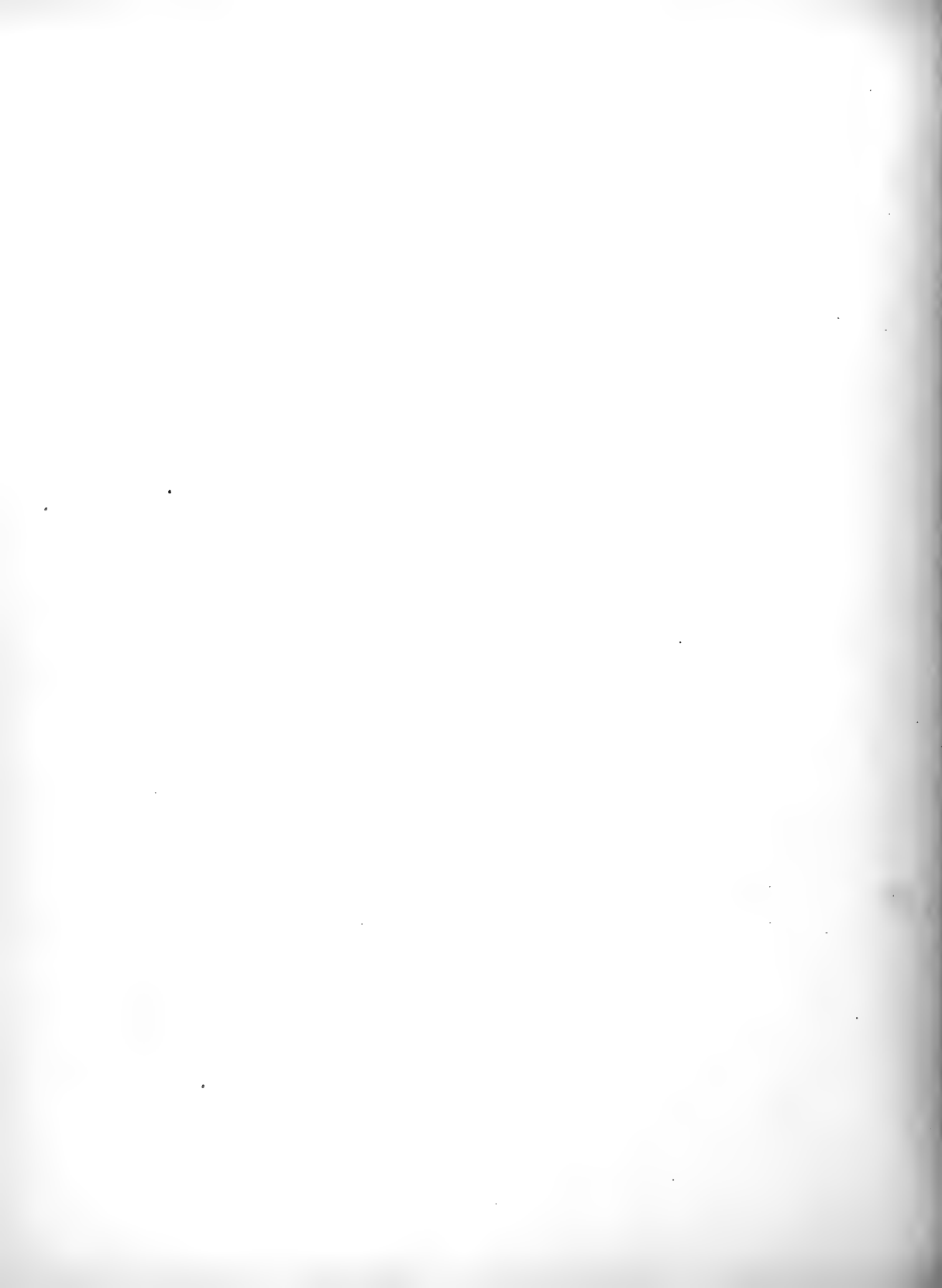
[GENUS LOMARIA, WILLD.

Lomaria nigra, Col. in *Tasm. Journ. Nat. Sci.* (1846) 176; *Hook. f. Fl. Nov. Zel.* ii, 31; *Cheesen. Man. N.Z. Fl.* 982.

Mr. Colenso, in January, 1842, while travelling from Rotorua to Tauranga along the old Maori track connecting the two districts, and which then led through an almost continuous forest, was the first to collect this very curious and peculiar plant, which he found "in a low, wet, and dark spot," apparently not far from the Mangarewa River. After the lapse of seventy years it can still be seen in abundance in the same forest. It was next gathered by Dr. Sinclair in some locality in the Auckland Provincial District, and by Dr. Lyall in the Sounds of the south-west coast of Otago. Since then it has been observed in numerous localities between Kaitaia and Stewart Island, but is far from being generally spread, and must not be counted as a common species. Mr. Colenso's remarks as to the nature of its habitat are exceedingly apt, for it is most plentiful in dark and dank spots in dense forests, and especially near the source of some mountain rivulet, where the shade is deep and the soil more or less springy or even boggy. It descends to sea-level, but is most plentiful between 500 ft. and 2,500 ft. elevation.

Lomaria nigra is easily recognized by the blackish-green colour of the frond, which is unusually tender and brittle. Apart from those characters, it can be distinguished by the broad terminal portion of the frond, which is often very slightly lobed, giving the whole frond a lyrato-pinnatifid appearance. The surface of the frond is often covered with mosses or hepaticæ, very much after the same fashion as *Trichomanes elongatum*, and their presence often gives the plant an untidy and unhealthy appearance. *L. nigra* is endemic in New Zealand.

PLATE 241. *Lomaria nigra*, drawn from specimens collected on Te Aroha Mountain. Fig. 1, a single pinna of the frond ($\times 3$); 2, tip of a fertile pinna ($\times 3$); 3, section of fertile pinna ($\times 6$); 4, two sporangia (enlarged).





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

LOMARIA FRASERI, A. Cunn.

PLATE 242.—*LOMARIA FRASERI*.

FAMILY FILICES.]

[GENUS *LOMARIA*, WILLD.

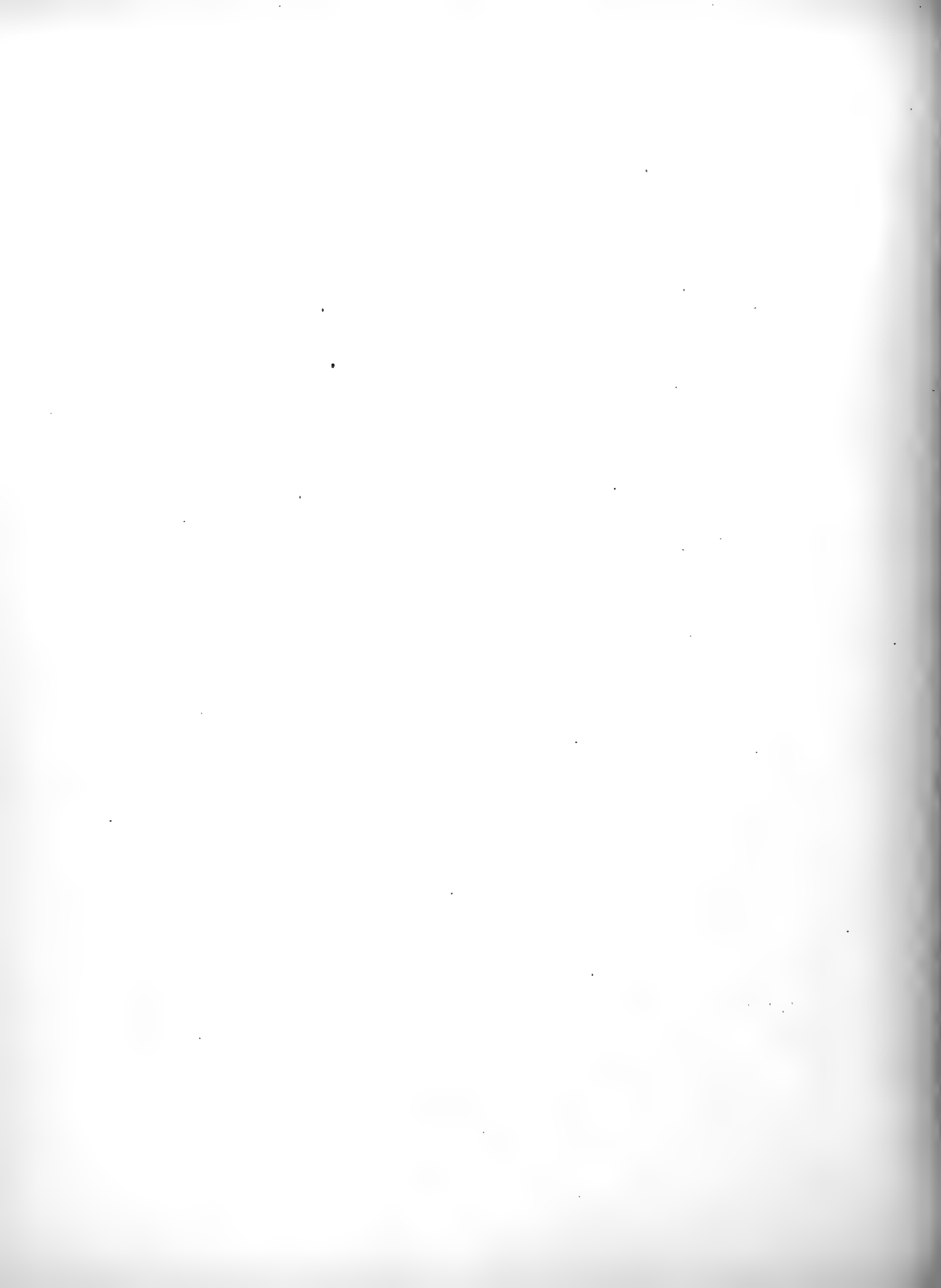
Lomaria Fraseri, *A. Cunn. Precur.* n. 185; *Cheesem. Man. N.Z. Fl.* 981.

According to Allan Cunningham, *Lomaria Fraseri* was first collected in 1825 at the Bay of Islands by Mr. C. Fraser, then Superintendent of the Sydney Botanical Gardens. Shortly afterwards it was also gathered by both the Cunninghams, and by most of the botanists who in the first half of the nineteenth century investigated the flora of the northern portion of the North Island. It was first published by Allan Cunningham in his "Precursor," under the very appropriate name of its first discoverer. Its chief centre of distribution is from the Waikato River northwards to the North Cape. Within this area it is plentiful in all forests of any size, especially where the soil is dry and the drainage good. It is particularly abundant in kauri forests, possibly from the reason that such forests are less encumbered with dense undergrowth than others, and consequently afford more room and rather more light, two conditions which are favourable for the growth of the plant. Proceeding south from Auckland it extends to the Bay of Plenty on the east coast and to Taranaki on the west. So far as I am aware, it has never been gathered in any part of the Hawke's Bay or Wellington Provincial Districts, but it reappears in the north-west of the South Island, extending from Collingwood and West Wanganui to Westport and Charleston, where it apparently attains its southern limit.

Lomaria Fraseri has a very distinct habit and appearance, and in many northern districts affects the physiognomy of the forest vegetation to no small degree. It usually forms large patches, which in some cases may be as much as half an acre in extent, and its slender erect caudex or stem rises to a height varying from 1 ft. to 3 ft. or more. These stems are half an inch or thereabouts in diameter, covered at the base with the ragged bases of the old stipites, and bearing at the top a crown of stiff dark-green fronds. A well-developed specimen thus presents the appearance of a miniature tree-fern, the resemblance being so close that several of the earlier explorers (as, for instance, Dr. Brackenridge, one of the naturalists to the United States Exploring Expedition) often speak of it under that name.

L. Fraseri occurs in the Philippine Islands, but so far has not been found in any intermediate locality.

PLATE 242. *Lomaria Fraseri*, drawn from specimens gathered in the Waitakare Range, near Auckland. Fig. 1, scale from the caudex; 2, portion of pinna of sterile frond; 3, upper surface of portion of pinna from fertile frond; 4, under-surface of same, showing the sori; 5, cross-section of fertile segment; 6, a single sporangium. (All enlarged.)





M. Smith del.
J. H. Pritch lith

West, Newman imp.

ASPENIUM HOOKERIANUM, Col.

PLATE 243.—ASPLENIUM HOOKERIANUM.

FAMILY FILICES.]

[GENUS ASPLENIUM, LINN.

Asplenium Hookerianum, Col. in *Tasm. Jour. Nat. Sci.* (1846) 169; *Cheesem. Man. N.Z. Fl.* 992.

The discovery of *Asplenium Hookerianum* is vividly recounted by Mr. Colenso in his "Excursion made in the Northern Island of New Zealand," published in 1846 in the second volume of the "Tasmanian Journal of Natural Science." In this fascinating memoir he describes a three-months journey from the East Cape and Lake Waikare-moana to Rotorua and Tauparanga, returning to the Bay of Islands *via* the Thames Valley, the Waikato River, and the Kaipara. Giving an account of his journey up the Thames Valley after leaving Matamata, he says, "We entered a romantic valley, called by the Maoris Hinuera. This valley has on either side high and perpendicular volcanic rocks, composed of a conglomerate of pumice, scoria, obsidian, &c. . . . At 2 p.m. we halted to dine under a large and pensile crag, which, jutting out from the rocks on the north side, overhung our path. Here beneath this rock I discovered an elegant *Asplenium* (*A. Hookerianum*, n. sp.). I did myself the honour and pleasure of naming this graceful fern in memorial of my much-respected and talented friend J. D. Hooker, Esq." The remarkable flat-bottomed valley mentioned by Mr. Colenso leads directly to the Thames River from the valley of the Waikato about eight miles above Cambridge, and is supposed by many geologists to indicate the bed of the Waikato when it discharged into the Hauraki Gulf instead of following its present course to the west side of the Island.

Attention having once been directed to *Asplenium Hookerianum* it was soon found to have a fairly wide distribution, ranging from Kaitaia to the south of Otago, although it is sometimes absent from areas of considerable size. It is usually found on the faces of inland cliffs, or on steep shaded banks, and does not, as a rule, occur in dense forests. Like all its allies, it is exceedingly variable, and many diverse views have been held as to its limits and systematic position. A finely cut variety with linear segments to the pinnæ has been described by Sir J. D. Hooker as a distinct species under the name of *A. Colensoi*; but, as Mr. Field has pointed out ("New Zealand Ferns," p. 120), not only do the two varieties grow intermixed, but sometimes fronds of both varieties occur on the same plant.

According to Mr. Bentham, *Asplenium Hookerianum* is found in both New South Wales and Victoria as well as New Zealand. I have had no opportunity of examining Australian specimens.

PLATE 243. *Asplenium Hookerianum*, drawn from specimens collected in the Wangapeka Valley, Nelson. Fig. 1, under-surface of pinnule; 2, under-surface of another pinnule; 3, small portion of a pinnule, showing a sorus with its indusium; 4, a single sporangium. (All enlarged.)



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

ASPIDIUM CYSTOSTEGIA, Hook.

PLATE 244.—ASPIDIUM CYSTOSTEGIA.

FAMILY FILICES.]

[GENUS ASPIDIUM, SWARTZ

Aspidium cystostegia, Hook. Sp. Fil. iv, 26, t. 227; Cheesem. Man. N.Z. Fl. 1000.

Aspidium cystostegia was first discovered on Mount Egmont in 1840 by Dr. Dieffenbach, the naturalist to the New Zealand Company. Through some mistake the locality was originally given as "Tongariro," but this is clearly erroneous, as Dieffenbach never ascended that mountain on account of opposition raised by the Maoris. It has, however, been since collected on both Tongariro and Ruapehu. About 1860 it was gathered by Mr. W. T. L. Travers on the Discovery Peaks, Waiau Valley, in the southern part of the Nelson Provincial District, and at the Wairau Gorge by Dr. Sinclair. Further investigation has proved that it is not uncommon on all the higher mountain-ranges of both the North and South Islands, from Mount Egmont and Tongariro southwards to Foveaux Strait. In 1890 Mr. Kirk collected it on the Auckland Islands, and in 1907 it was detected by Dr. Cockayne near the summit of Mount Anglem, Stewart Island. Its altitudinal range is from 3,000 ft. to 5,500 ft.

Aspidium cystostegia is usually found in little nooks and corners amongst stones on the bare mountain-slopes above the forest-level. In such situations it often forms large clumps, easily distinguished by the soft and tender pale-green fronds. It is remarkable for the extremely paleaceous stipes and rhachis, which are densely clothed with pale-brown scales up to the very tip of the frond. The involucres are different from those of any other species, being so convex as to look almost hemispherical, and at the same time are very thin and membranous, thus having a bladdery appearance. Although falling into the same section of the genus as *Aspidium vestitum*, it differs greatly in habit and in the characters mentioned above. Sir W. J. Hooker compared the ramification to that of *A. mohrioides*.

PLATE 244. *Aspidium cystostegia*, drawn from specimens collected on the mountains above Arthur's Pass, Canterbury Alps, at an altitude of 4,000 ft. Fig. 1, scale from the lower part of the stipes; 2, a single pinnule, showing sori; 3, indusium; 4, a single sporangium. (All enlarged.)



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

NEPHRODIUM HISPIDUM, Hook.

PLATE 245. -NEPHRODIUM HISPIDUM.

FAMILY FILICES.]

[GENUS NEPHRODIUM, RICH.

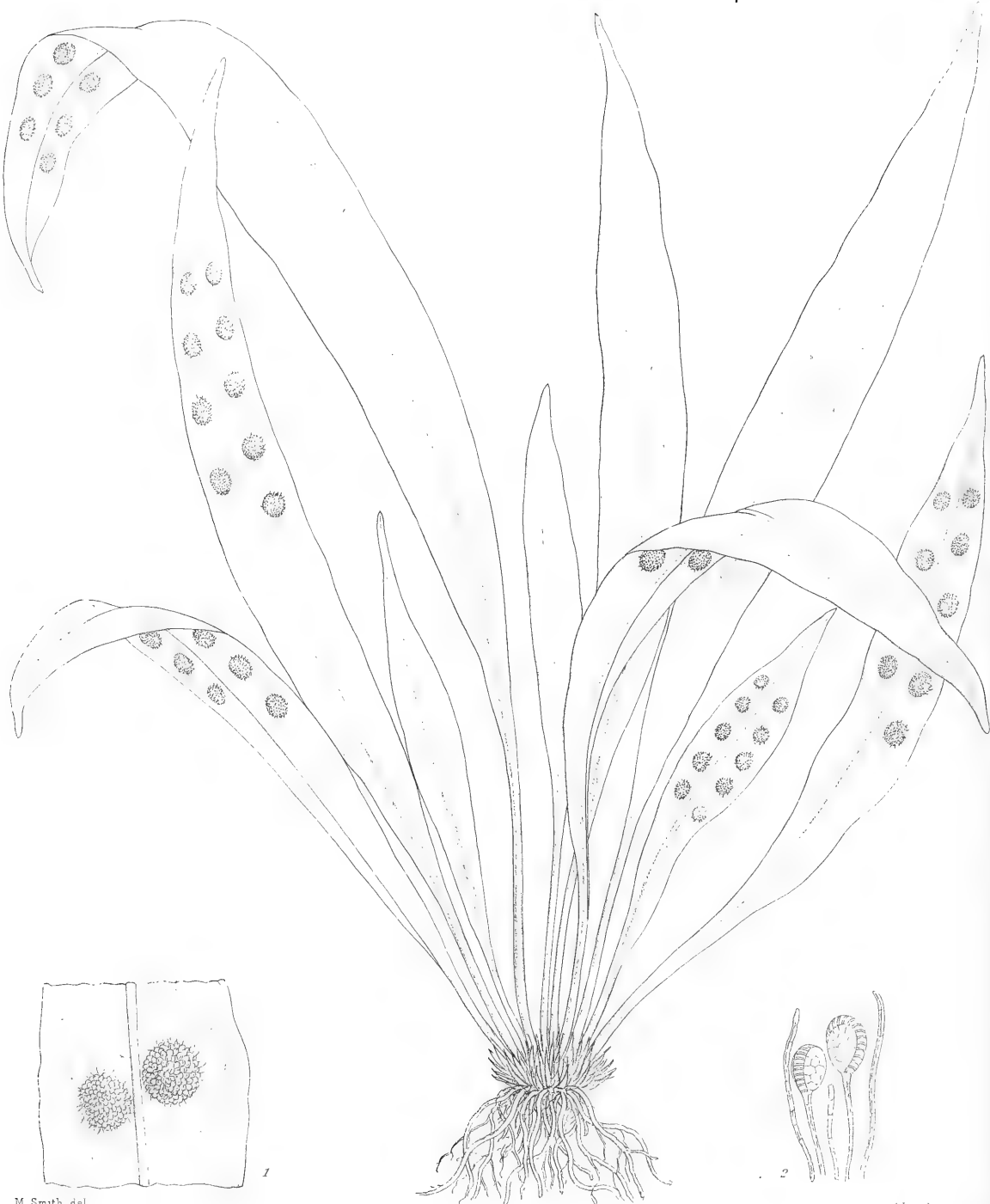
Nephrodium hispidum, Hook. Sp. Fil. iv, 150; Hook. f. Handb. N.Z. Fl. 378; Cheesem. Man. N.Z. Fl. 1004.

All travellers in the lowland forests of New Zealand are well acquainted with this beautiful fern, which at once attracts attention, wherever it may be seen, by its large finely cut fronds and the copious stiff black hairs on the rhachis and stipes. As with most widely distributed lowland plants that reach the coast-line, it was originally collected by Banks and Solander during Cook's first voyage. Solander, in his manuscript "Flora of New Zealand," gave it the name of *Polypodium setosum*, and states that it was found "in sylvis Novæ-Zelandiæ prope Tolaga, Opuragi, Totaranui." It was also gathered by Forster in Cook's second voyage, and in his "Prodromus" he retained Solander's most appropriate name. Unfortunately, however, it had been previously applied by Thunberg to a Japanese plant, and Swartz, in 1800, consequently selected the almost equally characteristic name of *Aspidium hispidum*. Since then it has been placed by turns in the genera *Lastrea*, *Nephrodium*, and *Polystichum*, and its systematic position may still be looked upon as unsettled.

The geographical range of *Nephrodium hispidum* stretches from the North Cape to the south of Stewart Island, and within those limits it is present in almost all forests of any size below an altitude of, say, 2,000 ft. It is most abundant on sloping hillsides on rather dry ground, and often covers considerable areas, its long and stout wide-creeping rhizomes sending up numerous fronds. Unlike its allies *N. decompositum* and *N. velutinum*, which prefer light bush or the outskirts of forests, *N. hispidum* is evidently more at home in much denser and more deeply shaded tracts of woodland. Its dark olive-brown fronds are sometimes curiously (but slightly) mottled or variegated with lighter shades. It is easily cultivated, and does well in any shaded bush-house if care is taken to provide good drainage and plenty of room for its long running rhizomes.

PLATE 245. *Nephrodium hispidum*, drawn from specimens collected on the Waitakerei Ranges near Auckland. Fig. 1, portion of rhachis, showing the stiff bristles ($\times 3$); 2, tip of pinnule, showing the sori ($\times 6$); 3, a single segment, with two sori ($\times 8$); 4, indusium (enlarged); 5, two sporangia (enlarged).





M. Smith del
J.N. Fitch lith

West. Newman in.

POLYPODIUM DICTYOPTERIS, Mett

PLATE 246.—POLYPODIUM DICTYOPTERIS.

FAMILY FILICES.]

[GENUS POLYPODIUM, LINN.

Polypodium Dictyopteris, Mett. in *Ann. Sci. Nat.* iv (1861), 15.

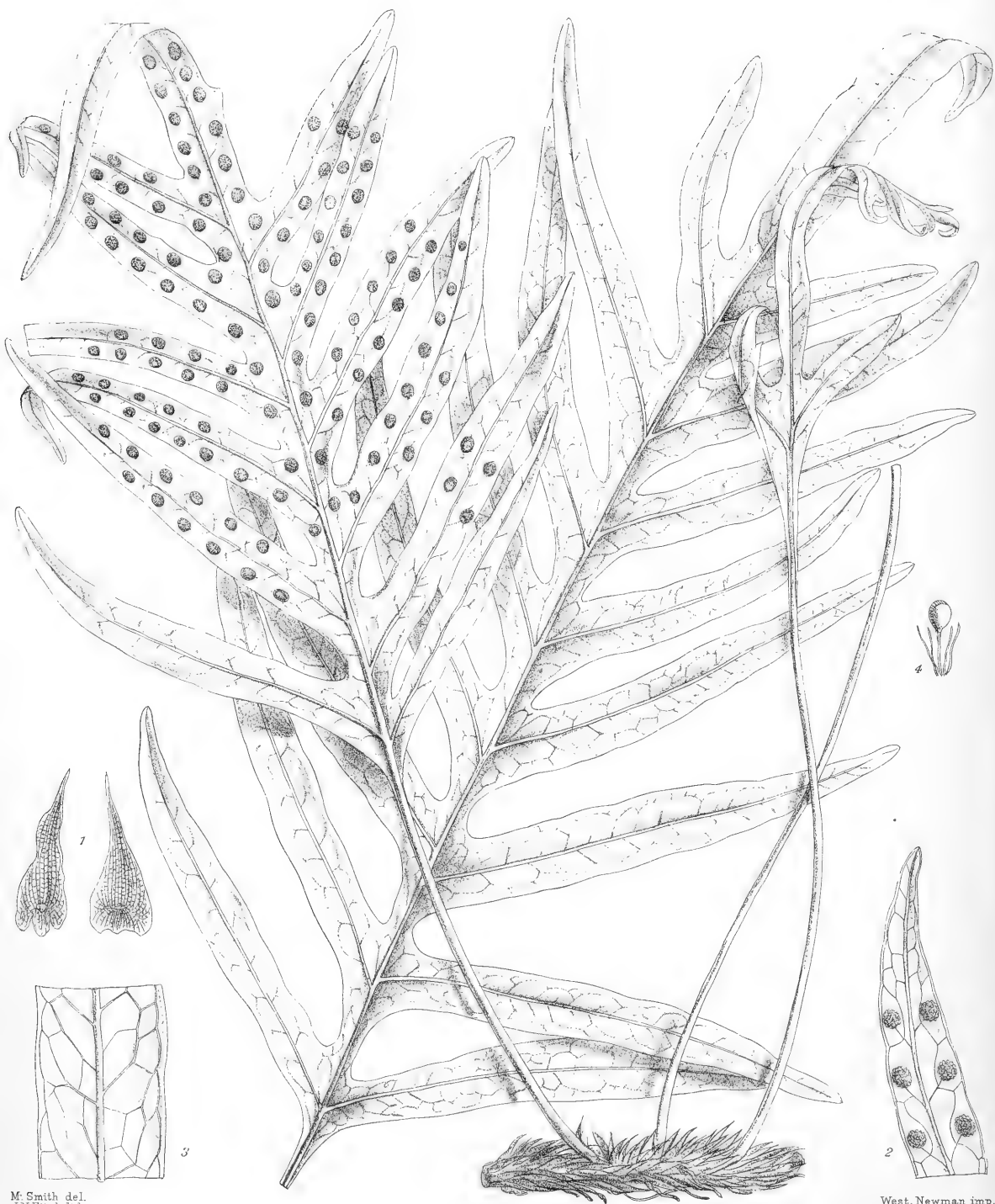
P. Cunninghamii, Hook. *Garden Ferns* ad t. 30 (1862); *Cheesem. Man. N.Z. Fl.* 1012.

This very distinct little plant was first gathered by D'Urville in 1827 during the voyage of the French exploring-vessel "L'Astrolabe." D'Urville's collections were worked out by the eminent botanist A. Richard, and published in his "Essai d'une Flore de la Nouvelle Zélande." In this work he unfortunately confounded the species now figured with the Australian *P. attenuatum* (now known as *P. Brownii*), and in this error he was followed by Allan Cunningham and Raoul. No locality was given by Richard for D'Urville's plant, but it was probably obtained at the Bay of Islands, or possibly in the Hauraki Gulf. According to Sir W. J. Hooker ("Icones Plantarum," t. 409) it was next gathered by Allan Cunningham, although in the "Precursor" no reference is made to any collector besides D'Urville. Since that time it has been found to have a fairly general distribution in lowland districts in the North Island, from the North Cape to Cook Strait. In the South Island it is much more local. It has been gathered by myself near Nelson, Mr. Townson has found it to be fairly plentiful in the lower part of the Buller Valley, Mr. Buchanan has recorded it from Marlborough, and Raoul collected it at Akaroa. In this last locality, however, it does not seem to have been noticed by any recent explorer.

The very diverse views held by pteridologists as to the classification of ferns are responsible for the frequent changes of nomenclature that *P. Dictyopteris* has suffered. Sir W. J. Hooker, in the "Genera Filicum," placed it, combined with the Australian *P. attenuatum*, in Presl's genus *Dictyopteris*, most of the species of which, however, belong to *Aspidium*. Mr. J. Smith appears to have been the first to recognize that the New Zealand plant differed from the Australian, and in 1846 placed the two species in a new genus which he called *Dictymia*, and this view was adopted by Sir J. D. Hooker in the "Flora Novæ Zelandiæ." In 1862 Sir W. J. Hooker, in his "Garden Ferns," reduced the species to *Polypodium*, and, as Smith's specific name of *lanceolata* was preoccupied, proposed that it should bear the title of *P. Cunninghamii*. A few months earlier, however, it had been published by Mettenius under the name of *P. Dictyopteris*, which, under the law of priority of publication, must now take precedence.

P. Dictyopteris is usually found on the trunks of forest-trees or on the faces of rocks, and has an altitudinal range from sea-level to 2,500 ft. According to Mr. Baker, a plant collected by Mr. Moore on the Island of Mallicola, New Hebrides, must be referred to the same species.

PLATE 246. *Polypodium Dictyopteris*, drawn from specimens collected at Mount Wellington, near Auckland. Fig. 1, portion from the middle of the frond, showing two sori ($\times 3$); 2, two sporangia, with the jointed hairs which usually accompany them (enlarged).



West, Newman imp.

POLYPODIUM NOVAE ZEALANDIAE, Baker.

M. Smith del.
J.N. Fitch lith.

PLATE 247.—POLYPODIUM NOVÆ-ZEALANDIÆ.

FAMILY FILICES.]

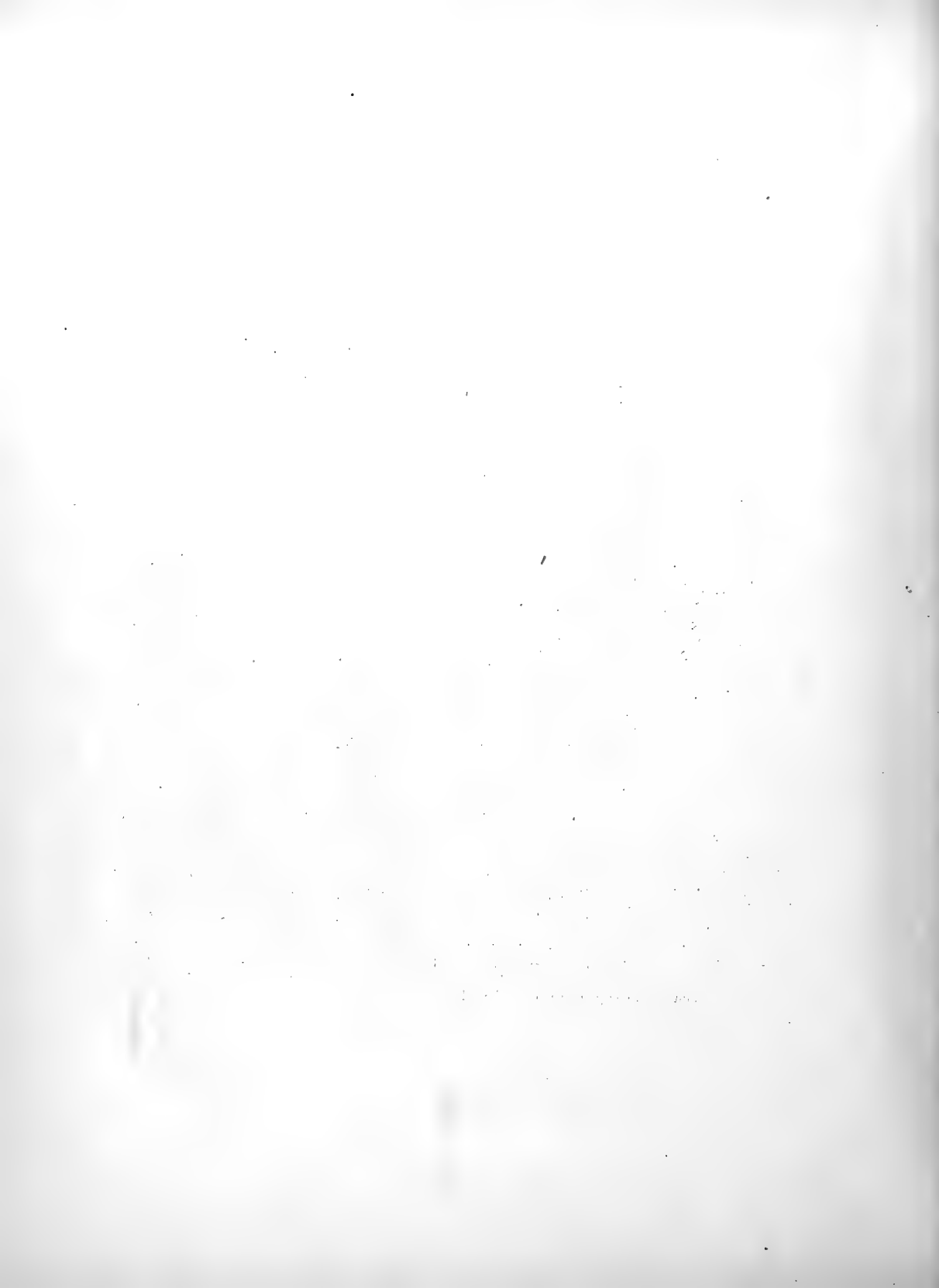
[GENUS POLYPODIUM, LINN

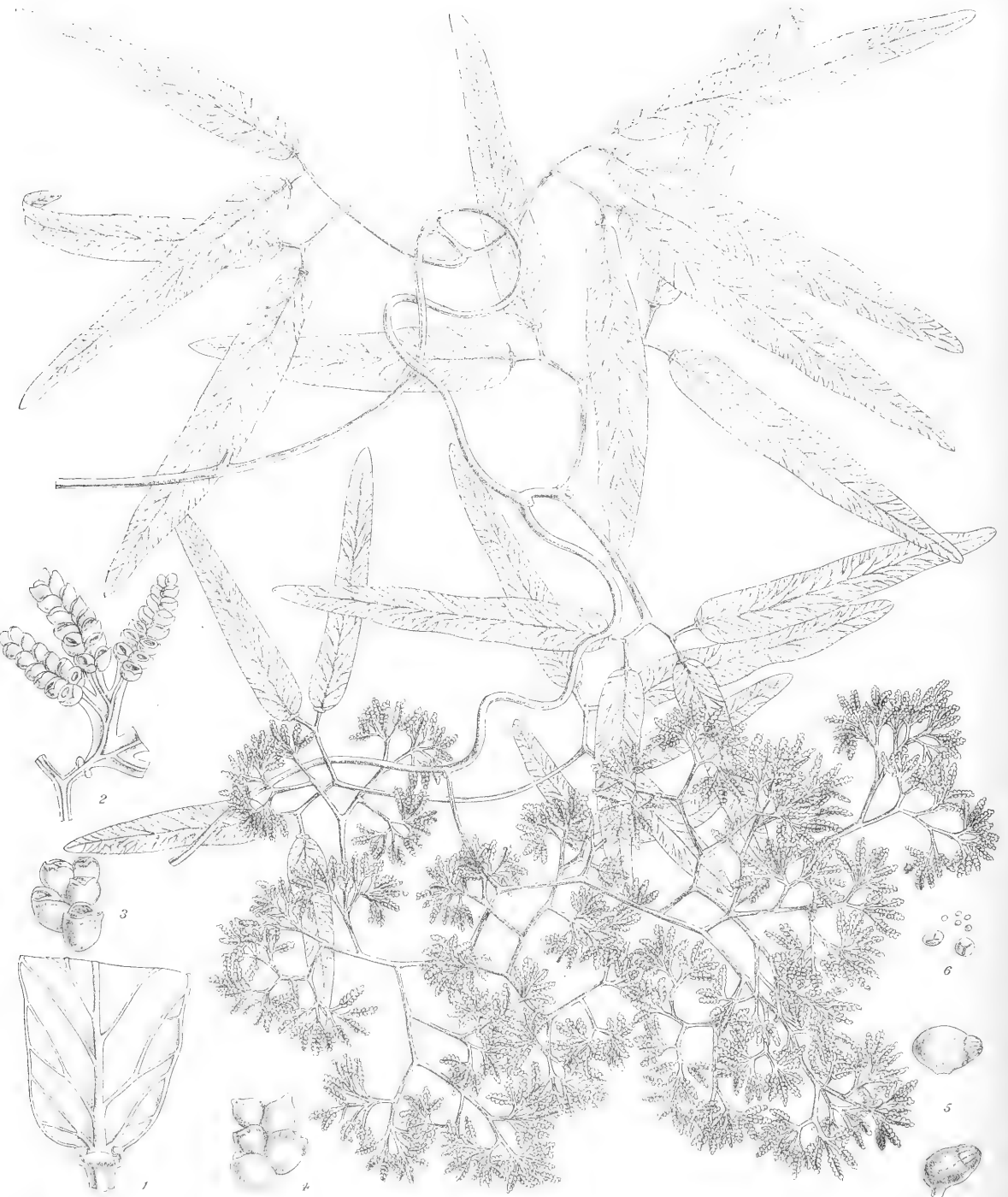
Polypodium novæ-zealandiæ, Bak. in Hook. Ic. Plant. t. 1674; Cheesem. Man. N.Z. Fl. 1014.

So far as is at present known, this handsome species has the most restricted range of any of the New Zealand *Polypodia*. It was first collected by myself in January, 1877, on Mount Pirongia, a picturesque extinct volcano densely wooded from base to summit, and situated a little to the west of the Township of Alexandra, in the Upper Waipa district. About the same time it was gathered by Mr. H. C. Field in the forest country to the west of Ruapehu. A little later I observed it on Mount Karioi, immediately to the south of Raglan Harbour; on Maungatautari Mountain, to the south of Cambridge; and also on Te Aroha Mountain, which appears to be its northern limit. Mr. Hamilton has gathered it at Lake Waikare-moana, and of late years it has been collected by myself and others in many localities in the high wooded country lying between the Wanganui River, Taupo, and Ruapehu. So far it has not been found to the east of Ruapehu, but I suspect that it occurs on the flanks of the Kaimanawa and Tararua Mountains. From the above it appears that the species is confined to the high forest country in the interior of the North Island. I have not myself seen it below 2,000 ft., but I believe that it descends to lower altitudes in the district between Ohakune and the Wanganui River.

P. novæ-zealandiæ is closely allied to the widely spread *P. Billardieri*, but it can be readily distinguished from all the forms of that variable plant by the stouter rhizome, which is densely clothed with shaggy spreading scales widely different from the closely appressed squamæ of *P. Billardieri*. It is also a much larger plant, the fronds being occasionally 4 ft. in length, and the segments are far more numerous and much longer and narrower. The texture of the fronds is thinner and the sori smaller. In addition to the above, I have failed to observe any tendency to the polymorphism of the fronds so well marked in both *P. Billardieri* and *P. pustulatum*, and I am not aware that simple fronds have ever been seen.

PLATE 247. *Polypodium novæ-zealandiæ*, drawn from specimens collected on Te Aroha Mountain, at an altitude of 2,000 ft. Fig. 1, scales from the rhizome ($\times 3$); 2, tip of fertile pinna, showing the venation and sori ($\times 2$); 3, portion of pinna from a sterile frond, showing venation ($\times 2$); 4, a sporangium and some jointed hairs (enlarged).





M. Smith del.
J.N. Pritch lith.

West, Newman imp.

LYGODIUM ARTICULATUM, A. Rich.

PLATE 248.—LYGODIUM ARTICULATUM.

FAMILY FILICES.]

[GENUS LYGODIUM, SWARTZ.]

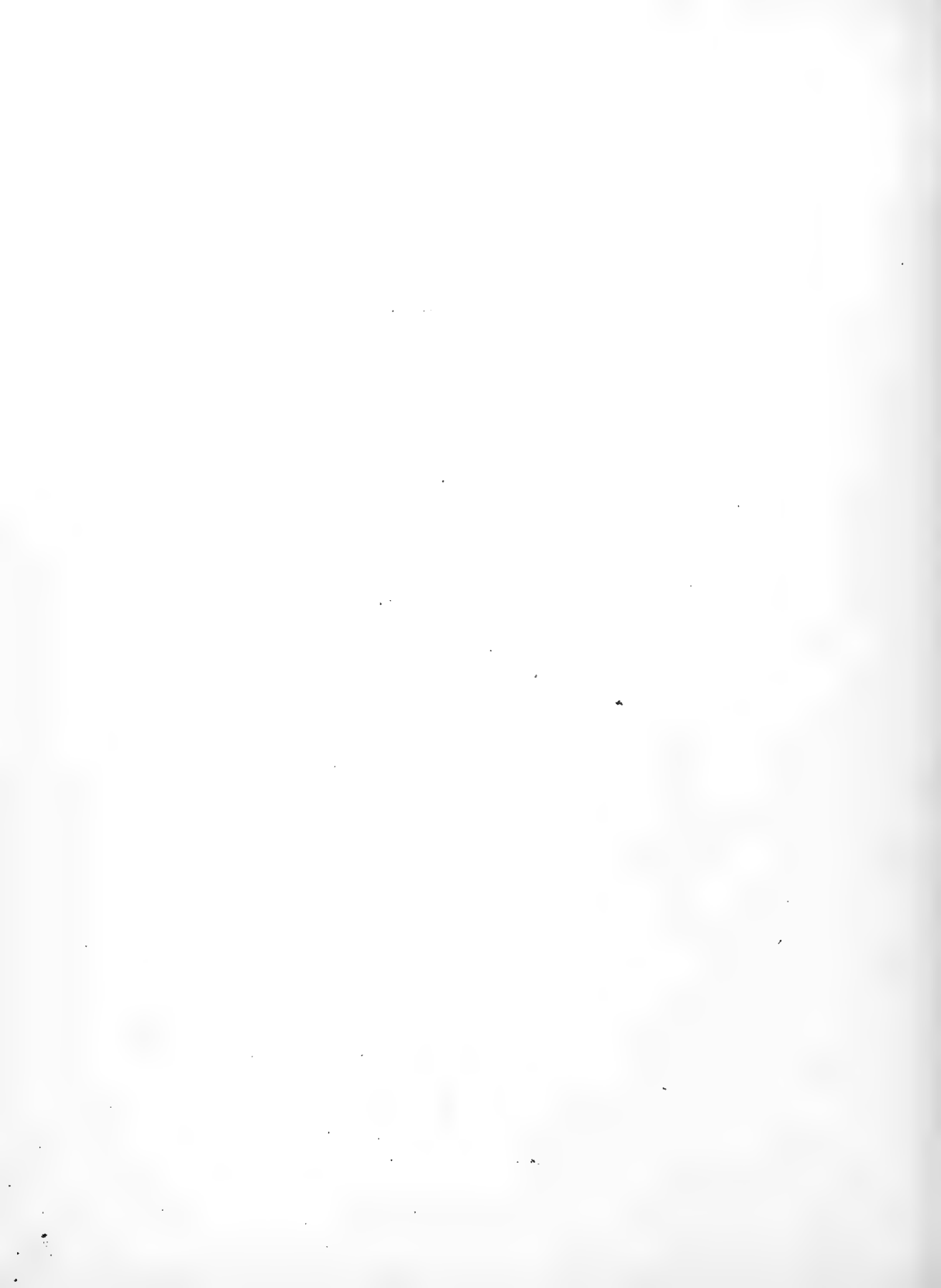
Lygodium articulatum, A. Rich. *Fl. Nouv. Zel.* 96, t. 15; Hook. f. *Fl. Nov. Zel.* ii, 47; Cheesem. *Man. N.Z. Fl.* 1023.

The genus *Lygodium* can be distinguished from all others by the tall climbing stems often many feet in length, which wind round trees or shrubs, forming almost impenetrable tough and wiry screens. Between twenty and twenty-five species are known, of which the North American *L. palmatum*, the Japanese *L. japonicum*, and the New Zealand *L. articulatum* are the only ones which penetrate into temperate regions, the remaining species being strictly tropical.

As might be expected from its great abundance in the northern portion of the North Island, *Lygodium articulatum* was one of the plants collected during Cook's first voyage to New Zealand. In November, 1769, Banks and Solander gathered it at Mercury Bay, where they found it "volubilis circa ramos arborum in sylvis umbrosis." It was fully described (but not figured) in Solander's manuscripts, and was placed by him in the genus *Ophioglossum*. It was not met with again until 1827, when D'Urville, of the French exploring-vessel "L'Astrolabe," obtained it in some locality in the North Island. After D'Urville's return to Europe it was published by A. Richard under the name it still bears. From that time onwards it was noticed by every botanist who examined the vegetation of the northern half of the North Island, and it is now known to be abundant in forest districts from the North Cape to the Bay of Plenty on the east coast, and to Kawhia on the west. Its distribution, in fact, is very similar to that of the kauri (*Agathis australis*), with which it is often associated.

The tough twining stems of *Lygodium articulatum* were formerly twisted into ropes by the Maoris, and used for securing the thatch on the roofs of their houses. They were also ingeniously woven into eel-traps called *hinaki*, great numbers of which were formerly made, although at the present time they have become comparatively rare.

PLATE 248. *Lygodium articulatum*, drawn from specimens collected by Miss Shakespear on the Little Barrier Island. Fig. 1, base of a sterile pinnule; 2, portion of fertile pinnule; 3 and 4, two views of a portion of a fertile spikelet, showing two rows of sporangia, each enclosed in its indusium; 5, two sporangia; 6, spores. (All enlarged.)





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

TODEA SUPERBA, Col.

PLATE 249.—TODEA SUPERBA.

FAMILY FILICES.]

[GENUS TODEA, WILLD.

Todea superba, Col. in *Tasm. Journ. Nat. Sci.* (1846) 188; *Chœson. Man. N.Z. Fl.* 1025.

The specific epithet of *superba* might well be conferred on this plant, which is by far the most beautiful fern in New Zealand. When seen in full luxuriance, as in the soaking rain-forests of Westland, or in the almost equally humid districts near the sources of the various branches of the Wanganui River, no description can give an adequate idea of its beauty and grace, or of the delicate lace-like tracery of its pellucid fronds. It was originally discovered by Mr. Colenso in 1841, in the dense primæval forests surrounding Lake Waikare-moana, which he was the first European to visit; but shortly afterwards it was collected by Lyall and other observers in several localities in both the North and South Islands. Its northern limit, so far as I am aware, is on Te Aroha Mountain, on the eastern side of the Island, and on the Pirongia Ranges on the west. From these two localities it stretches southwards in dense and cool humid forests to Cook Strait, and down the west coast of the South Island, where it is plentiful. On the eastern side it is rare and local. It reappears in Stewart Island, and it has also been recorded from the Auckland Islands, on the authority of General Bolton, but has not been noticed by any recent visitor to the group.

When growing in cool moist forests at an elevation of 1,500 ft. to 2,000 ft. or more, *Todea superba* often covers extensive areas. Each plant is furnished with a stout conical caudex or stem, sometimes 3 ft. in height, which is coated with densely matted fibrous rootlets. Surmounting that is a spreading crown of fronds, numbering from 6 to 15, and which vary in length from 18 in. to 3 ft. or even 4 ft. Both Mr. Colenso and Mr. Field have drawn attention to the charming contrast in colour presented in early summer by the outer drooping fronds of the previous year's growth, which are a dark semi-transparent green, and the almost erect younger fronds in the centre, which are a bright and delicate pale translucent green.

Todea superba, together with the closely allied *T. hymenophylloides*, the Australian and Polynesian *T. Fraseri*, and the Lord Howe Island *T. Moorei*, differ from the type of the genus in the thin and membranous fronds, which resemble in texture those of *Hymenophyllum* and *Trichomanes*, and constitute Presl's genus *Leptopteris*. Although the differences are not of a pronounced character, they are conspicuous and well marked, and many botanists now agree with this subdivision of the genus.

PLATE 249. *Todea superba*, drawn from specimens collected at Mamaku, on the Rotorua Railway, at an altitude of 2,000 ft. Fig. 1, a small portion of the frond, with three pinnules; 2, the same more highly magnified; 3, three pinnules from a fertile frond; 4, two segments from a pinnule, each with a sporangium at its base; 5, two sporangia (all enlarged); 6, an entire plant (greatly reduced).

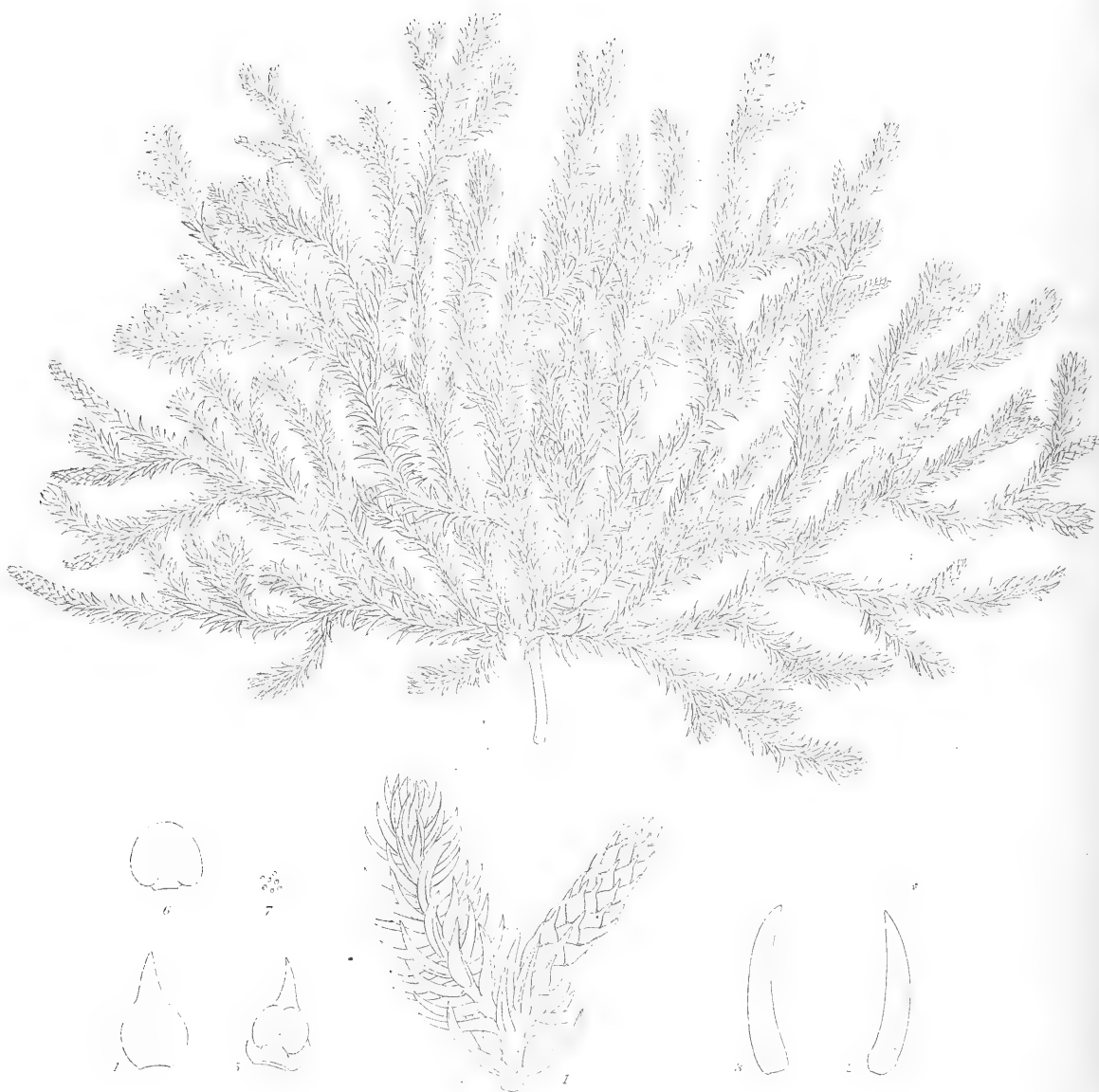


PLATE 250.—LYCOPODIUM RAMULOSUM.

FAMILY LYCOPODIACEÆ.]

[GENUS LYCOPODIUM, LINN.

Lycopodium ramulosum, T. Kirk in *Trans. N.Z. Inst.* xi (1879), 456, t. 19B; *Cheesem. Man. N.Z. Fl.* 1038.

According to Mr. T. Kirk, *Lycopodium ramulosum* was originally discovered by Mr. Tipler near Hokitika, and at a little later date by Mr. A. Hamilton at Okarito. Its distinctness as a species was first established by Mr. Kirk in 1879, when he gave a full description of it under the name it still bears. In 1884 Mr. Kirk recorded its presence in Stewart Island, remarking that it was found chiefly "in open peaty land and in swampy woods," and that in some localities it covered "acres of ground." Between 1885 and 1905 it was collected in several localities in Westland by Mr. J. W. Brame and other observers, and in 1906 Mr. Townson extended its northern range by ascertaining that it is an abundant plant on several of the upland "pakihi" near Westport. Lastly, in 1909, Dr. Cockayne, in his report on the vegetation of Stewart Island, states that it is extremely common in "Bog, openings in subalpine scrub, and in subalpine meadow." From the above it is apparent that the plant is fairly plentiful in peaty moorlands from north-west Nelson to the south of Stewart Island. Its altitudinal range is from sea-level to 2,500 ft.

L. ramulosum is more closely allied to the Australian *L. diffusum* than to any other species, principally differing, as Mr. Baker has remarked, in its entirely terminal spikes, whereas in *L. diffusum* they are frequently lateral. The ordinary form of *L. laterale* can be distinguished at a glance by its erect sparingly branched stems, with purely lateral spikes. On the whole, *Lycopodium ramulosum* is well marked by its terminal spikes, compactly branched habit of growth, and by the procumbent or prostrate stems.

PLATE 250. *Lycopodium ramulosum*, drawn from specimens collected near Kumara, Westland, by Mr. Brame. Fig. 1, portion of a branchlet, with a spike ($\times 3$); 2 and 3, leaves ($\times 6$); 4, dorsal view of bract; 5, front view of bract, showing the sporangium; 6, sporangium; 7, spores. (All enlarged.)

ILLUSTRATIONS OF NEW ZEALAND PHANEROGAMS AND FERNS THAT HAVE APPEARED PRIOR TO THE PUBLICATION OF THIS WORK.

RANUNCULACEÆ.

- Clematis indivisa*, Willd.—Paxt. Fl. Gard. i, t. 12; Gard. Chron. 1895, ii, t. 54; 1901, i, t. 82; 1905, ii, t. 47; Hetley, Nat. Fl. N.Z. t. 1; Featon, Art. Alb. N.Z. Fl. t. 1; Laing & Blackw. Pl. N.Z. t. 45.
- Clematis indivisa*, Willd. var. *lobulata*, T. Kirk.—Bot. Mag. t. 4398.
- Clematis hexasepala*, D.C.—Hook. f. Fl. Nov. Zel. i, t. 1 (*C. Colensoi*).
- Clematis fatida*, Raoul—Choix, t. 22.
- Clematis parviflora*, A. Cunn.—Laing & Blackw. Pl. N.Z. t. 48.
- Clematis ajoliata*, Buch.—Cockayne, N.Z. Pl. 161.
- Ranunculus Lyallii*, Hook. f.—Bot. Mag. t. 6888; Hetley, Nat. Fl. N.Z. t. 11; Featon, Art. Alb. N.Z. Fl. t. 3; Laing & Blackw. Pl. N.Z. t. 49.
- Ranunculus insignis*, Hook. f.—Fl. Nov. Zel. i, t. 2; Featon, Art. Alb. N.Z. Fl. t. 4.
- Ranunculus Monroii*, Hook. f.—Buch. Trans. N.Z. Inst. xix (1887), t. 16 (*R. Muelleri*).
- Ranunculus pinguis*, Hook. f.—Fl. Antaret. i, t. 1.
- Ranunculus nivicola*, Hook.—Ic. Plant. t. 571, 572.
- Ranunculus geraniifolius*, Hook. f.—Fl. Nov. Zel. i, t. 3.
- Ranunculus Engelmii*, T. Kirk—(?) Buch. Trans. N.Z. Inst. xx (1888), t. 12 (*R. tenuis*).
- Ranunculus Berggreni*, Petrie—Trans. N.Z. Inst. xxxi (1899), t. 26.
- Ranunculus hirtus*, Banks & Sol.—Featon, Art. Alb. N.Z. Fl. t. 5, fig. 1 (*R. plebeius*).
- Ranunculus lappaceus*, Smith—Hook. f. Fl. Nov. Zel. i, t. 5 (*R. multiscapus*).
- Ranunculus Kirkii*, Petrie—Trans. N.Z. Inst. xxxi (1899), t. 25.
- Ranunculus macropus*, Hook. f.—Ic. Plant. t. 634.
- Ranunculus rivularis*, Banks & Sol. var. *major*, Benth.—Hook. f. Fl. Nov. Zel. i, t. 4 (*R. incisus*).
- Ranunculus rivularis*, Banks & Sol. var. *inconspicuus*, Benth.—Hook. f. Fl. Tasm. i, t. 2b (*R. inconspicuus*).
- Ranunculus acaulis*, Banks & Sol.—Hook. f. Fl. Antaret. i, t. 2.
- Ranunculus crassipes*, Hook. f.—Fl. Antaret. ii, t. 81; Wildem. Bot. Voy. Belg. t. 12, f. 12-22.
- Ranunculus Limosella*, F. Muell.—Ic. Plant. t. 1081 (*R. limoselloides*).
- Caltha novæ-zelandiæ*, Hook. f.—Fl. Nov. Zel. i, t. 6; Featon, Art. Alb. N.Z. Fl. t. 5, f. 2.

MAGNOLIACEÆ.

- Drimys axillaris*, Forst.—Char. Gen. t. 42; Ic. Plant. t. 576; T. Kirk, Forest Fl. t. 1; Featon, Art. Alb. N.Z. Fl. t. 5, f. 3.
- Drimys colorata*, Raoul—Choix, t. 23; T. Kirk, Forest Fl. t. 2 (*D. axillaris*, var. *colorata*).
- Drimys Traversii*, T. Kirk—Buch. Trans. N.Z. Inst. xv (1883), t. 28, f. 1 (*Hymenanthera*).

CRUCIFERÆ.

- Cardamine hirsuta*, Linn. var. *debilis*, Hook. f.—Ic. Plant. t. 58 (*C. heterophylla*); Featon, Art. Alb. N.Z. Fl. t. 6, f. 1.
- Cardamine hirsuta*, var. *corymbosa*, Hook. f.—Ic. Plant. t. 686 (*C. corymbosa*).
- Cardamine depressa*, Hook. f.—Fl. Antaret. i, t. 3, 4b.
- Cardamine depressa*, var. *stellata*, Hook. f.—Fl. Antaret. i, t. 4a (*C. stellata*).
- Cardamine stylosa*, D.C.—Ic. Plant. t. 259 (*Arabis gigantea*).
- Cardamine fastigiata*, Hook. f.—Buch. Trans. N.Z. Inst. xix (1887), t. 14 (*Pachycladon elongata*).
- Pachycladon novæ-zelandiæ*, Hook. f.—Ic. Plant. t. 1009; Buch. Trans. N.Z. Inst. xiv (1882), t. 24, f. 1, and f. 2 (*P. glabra*); Featon, Art. Alb. N.Z. Fl. t. 6, f. 2.
- Lepidium Banksii*, T. Kirk—A. Rich. Fl. Nouv. Zel. t. 35 (*L. oleraceum*).
- Notolaspis rosulatum*, Hook. f.—Buch. Trans. N.Z. Inst. xiv (1882), t. 25 (*N. notabilis*); Featon, Art. Alb. N.Z. Fl. t. 6, f. 4; Cockayne, N.Z. Pl. t. 46.

VIOLACEÆ.

- Melicytus ramiflorus*, Forst.—Char. Gen. t. 62; Kirk, Forest Fl. t. 3; Featon, Art. Alb. N.Z. Fl. t. 7, f. 2, 3; Laing & Blackw. Pl. N.Z. t. 56.
- Melicytus lanceolatus*, Hook. f.—Fl. Nov. Zel. i, t. 8.
- Hymenanthera novæ-zelandiæ*, Hemsl.—Hook. f. Fl. Nov. Zel. i, t. 7 (*H. crassifolia*); Gard. Chron. 1875, i, t. 42; 1892, ii, t. 67 (*H. crassifolia*).
- Hymenanthera dentata*, R. Br. var. *angustifolia*, Benth.—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 33, f. 44-47 (seedling).

PITTOSPORACEÆ.

- Pittosporum tennifolium*, Banks & Sol.—A. Rich. Fl. Nouv. Zel. t. 34 (*Trichilia monophylla*); T. Kirk Forest Fl. t. 46; Featon, Art Alb. N.Z. Fl. t. 8, f. 1; Laing & Blackw. Pl. N.Z. t. 56.
Pittosporum obcordatum, Raoul—Choix, t. 24.
Pittosporum rigidum, Hook. f.—Fl. Nov. Zel. i, t. 10; Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 30, f. 4, and xxxiii (1901), t. 10, f. 1-3 (seedling).
Pittosporum Ralphi, T. Kirk—Gard. Chron. 1899, ii, f. 72 (*P. crassifolium*).
Pittosporum crassifolium, A. Cunn.—Bot. Mag. t. 5978; T. Kirk, Forest Fl. t. 14; Featon, Art Alb. N.Z. Fl. t. 8, f. 2.
Pittosporum cornifolium, A. Cunn.—Bot. Mag. t. 3161; Featon, Art Alb. N.Z. Fl. t. 10; Laing & Blackw. Pl. N.Z. t. 57, 58.
Pittosporum eugenioides, A. Cunn.—T. Kirk, Forest Fl. t. 49; Featon, Art Alb. N.Z. Fl. t. 9.

CARYOPHYLLACEÆ.

- Stellaria decipiens*, Hook. f.—Ic. Plant. t. 680.
Stellaria Roughii, Hook. f.—Featon, Art Alb. N.Z. Fl. t. 6, f. 5; Cockayne, Trans. N.Z. Inst. xxxiii (1901), t. 10, f. 4 (seedling).
Stellaria gracilentia, Hook. f.—Featon, Art Alb. N.Z. Fl. t. 6, f. 5.
Colobanthus muscoides, Hook. f.—Homb. & Jacq. Voy. au Pole Sud, t. 17, f. F.
Colobanthus quitensis, Bartl.—Presl. Reliq. Haenk. ii, t. 49, f. 2.
Colobanthus brevisepalus, T. Kirk—Trans. N.Z. Inst. xxvii (1895), t. 27E.
Colobanthus subulatus, Hook. f.—Fl. Antarct. ii, t. 93.
Colobanthus acicularis, Hook. f.—Featon, Art Alb. N.Z. Fl. t. 6, f. 7.
Colobanthus Buchananii, T. Kirk—Trans. N.Z. Inst. xxvii (1895), t. 27D.
Spergularia media, Presl.—Featon, Art Alb. N.Z. Fl. t. 6, f. 8.

PORTULACÆÆ.

- Claytonia australasica*, Hook. f.—Ic. Plant. t. 293; Featon, Art Alb. N.Z. Fl. t. 6, f. 9.
Montia fontana, Linn.—Cockayne, Rept. Tong. Nat. Park, t. 27.
Hectorella cæspitosa, Hook. f.—Ic. Plant. t. 1046; Buch. Trans. N.Z. Inst. xiv (1882), t. 26, f. 1, and xvi (1884), t. 35 (*H. elongata*).

MALVACEÆ.

- Plagianthus divaricatus*, Forst.—Char. Gen. t. 43; Bot. Mag. t. 3271; Buch. Trans. N.Z. Inst. xvi (1884), t. 34, f. 2; Featon, Art Alb. N.Z. Fl. t. 11, f. 1; Laing & Blackw. Pl. N.Z. t. 80; Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 31, f. 9, 10, 11 (seedling).
Plagianthus betulinus, A. Cunn.—Poit. in Ann. Sci. Nat. ser. ii, viii, t. 3 (*Philippodendron regium*); T. Kirk, Forest Fl. t. 103, 104; Cockayne, Trans. N.Z. Inst. xxxiii (1901), t. 10, f. 11-15.
Hoheria populnea, A. Cunn. var. *vulgaris*—Ic. Plant. t. 565, 566; T. Kirk, Forest Fl. t. 53; Gard. Chron. 1901, ii, Nov. 23.
Hoheria populnea, A. Cunn. var. *lanceolata*, Hook. f.—T. Kirk, Forest Fl. t. 54, 54A, 54B; Featon, Art Alb. N.Z. Fl. t. 12; Gard. Chron. 1912, ii, f. 154.
Hoheria populnea, A. Cunn. var. *angustifolia*, Hook. f.—Raoul, Choix, t. 26 (*H. angustifolia*); T. Kirk Forest Fl. t. 54, 55; Laing & Blackw. Pl. N.Z. t. 79.
Gaya Lyallii, J. E. Bak.—Hook. f. Fl. Nov. Zel. i, t. 11 (*Hoheria Lyallii*); Bot. Mag. t. 5935 (*Plagianthus*); T. Kirk, Forest Fl. t. 134 (*Plagianthus*); Gard. Chron. 1888, ii, t. 24; 1907, i, f. 141; 1911, ii, f. 27 (all *Plagianthus*); Hetley, Nat. Fl. N.Z. t. 34 (*Plagianthus*); Featon, Art Alb. N.Z. Fl. t. 11, f. 2; Laing & Blackw. Pl. N.Z. t. 81.
Hibiscus trionum, Linn.—Featon, Art Alb. N.Z. Fl. t. 11, f. 3.
Hibiscus diversifolius, Jacq.—Ic. Plant. Rar. t. 551.

TILIACEÆ.

- Entelea arborescens*, R. Br.—Bot. Mag. t. 2480; A. Rich. Fl. Nouv. Zel. t. 34 (*Apeiba australis*); T. Kirk, Forest Fl. t. 33; Featon, Art Alb. N.Z. Fl. t. 13; Laing & Blackw. Pl. N.Z. t. 74; Schum. in Engl. & Prantl. Pflanzenf. iii, abt. 6, t. 9.
Aristotelia racemosa, Hook. f.—Ic. Plant. t. 601 (*Friesia*); Bot. Mag. t. 7868; T. Kirk, Forest Fl. t. 113; Hetley, Nat. Fl. N.Z. t. 26; Featon, Art Alb. N.Z. Fl. t. 14; Laing & Blackw. Pl. N.Z. t. 75.
Aristotelia fruticosa, Hook. f.—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 31, f. 14-20, and t. 34, f. 73.
Elaeocarpus dentatus, Vahl.—Forst. Char. Gen. t. 40 (*Dicera*); Ic. Plant. t. 602 (*E. Hinau*); T. Kirk, Forest Fl. t. 11; Featon, Art Alb. N.Z. Fl. t. 15, f. 1; Laing & Blackw. Pl. N.Z. t. 76.
Elaeocarpus Hookerianus, Raoul—Choix, t. 25; T. Kirk, Forest Fl. t. 12, 13; Laing & Blackw. Pl. N.Z. t. 77.

LINACEÆ.

- Linum monogynum*, Forst.—Bot. Mag. t. 3574; Hetley, Nat. Fl. N.Z. t. 24; Featon, Art Alb. N.Z. Fl. t. 15, f. 2.

GERANIACEÆ.

- Geranium dissectum*, Linn. var. *australe*, Benth.—Featon, Art Alb. N.Z. Fl. t. 16, f. 1.
Geranium microphyllum, Hook. f.—Fl. Antaret. i, t. 5.
Geranium sessiliflorum, Cav.—Diss. t. 77, f. 2.
Geranium Traversii, Hook. f.—Buch. Trans. N.Z. Inst. vii (1875), t. 13, f. 2; Hetley, Nat. Fl. N.Z. t. 10.
 Featon, Art Alb. N.Z. Fl. t. 16, f. 2.
Pelargonium australe, Jacq.—Featon, Art Alb. N.Z. Fl. t. 16, f. 3.
Ozalis corniculata, Linn.—Featon, Art Alb. N.Z. Fl. t. 16, f. 1.
Ozalis magellanica, Forst.—Hook. f. Fl. Nov. Zel. i, t. 13; Ic. Plant. t. 118 (*O. calanctata*); Featon, Art Alb. N.Z. Fl. t. 16, f. 5.

RUTACEÆ.

- Phebalium nudum*, Hook.—Ic. Plant. t. 568; Hetley, Nat. Fl. N.Z. t. 32; Featon, Art Alb. N.Z. Fl. t. 17, f. 1.
Melicope ternata, Forst.—Char. Gen. t. 28; Gaertn. Fruct. i, t. 68 (*Eptogonum lavigatum*); Ic. Plant. t. 603; T. Kirk, Forest Fl. t. 66; Featon, Art Alb. N.Z. Fl. t. 17, f. 2; Engl. in Pflanzenf. iii, abt. 4, t. 64.
Melicope ternata, Forst. var. *Mandellii*, T. Kirk—Forest Fl. t. 67.
Melicope simplex, A. Cunn.—Ic. Plant. t. 505; T. Kirk, Forest Fl. t. 68; G. M. Thoms. in Trans. N.Z. Inst. xxiv (1892), p. 417 (cleistogamic flowers); Laing & Blackw. Pl. N.Z. t. 66, 67.

MELIACEÆ.

- Diospyrum spectabile*, Hook. f.—Ic. Plant. t. 615–16 (*Hartighsea*); T. Kirk, Forest Fl. t. 64, 65; Hetley, Nat. Fl. N.Z. t. 9; Featon, Art Alb. N.Z. Fl. t. 18; Laing & Blackw. Pl. N.Z. t. 68; Harms in Pflanzenf. iii, abt. 4, t. 161.

OLACINACEÆ.

- Pennantia corymbosa*, Forst.—Char. Gen. t. 67; Hook. f. Fl. Nov. Zel. i, t. 12; T. Kirk, Forest Fl. t. 77, 78; Featon, Art Alb. N.Z. Fl. t. 19.

RHAMNACEÆ.

- Pomaderris elliptica*, Lab.—Pl. Nov. Holl. i, t. 86; Bot. Mag. t. 1510; Weberbauer in Pflanzenf. iii, abt. 5, t. 205; Featon, Art Alb. N.Z. Fl. t. 20; Gard. Chron. 1904, i, f. 148.
Pomaderris apetala, Lab.—Pl. Nov. Holl. i, t. 87; T. Kirk, Forest Fl. t. 8.
Pomaderris Edgerleyi, Hook. f.—Featon, Art Alb. N.Z. Fl. t. 21, f. 1.
Discaria Toumatou, Raoul—Choix, t. 29; T. Kirk, Forest Fl. t. 136; Featon, Art Alb. N.Z. Fl. t. 21, f. 3; Laing & Blackw. Pl. N.Z. t. 73; Cockayne, Trans. N.Z. Inst. xxxii (1900), t. 9, f. 19–22.

SAPINDACEÆ.

- Dodonaea viscosa*, Jacq.—T. Kirk, Forest Fl. t. 17; Featon, Art Alb. N.Z. Fl. t. 22.
Alectryon excelsum, Gaertn.—Fruct. i, t. 46; Ic. Plant. t. 570; T. Kirk, Forest Fl. t. 92, 93; Radlkofer in Pflanzenf. iii, abt. 5, t. 170; Featon, Art Alb. N.Z. Fl. t. 23.

ANACARDIACEÆ.

- Corynocarpus laevigata*, Forst.—Char. Gen. t. 16; Bot. Mag. t. 4379; T. Kirk, Forest Fl. t. 88; Gard. Chron. 1883, ii, f. 61; Featon, Art Alb. N.Z. Fl. t. 24.

CORIARIACEÆ.

- Coriaria ruscifolia*, Linn.—Bot. Mag. t. 2470; T. Kirk, Forest Fl. t. 139; Featon, Art Alb. N.Z. Fl. t. 25; Rowe, Trans. N.Z. Inst. xix (1897), t. 21; Laing & Blackw. Pl. N.Z. t. 69.

LEGUMINOSÆ.

- Corallospartium crassicaule*, Armistr.—Cockayne, Trans. N.Z. Inst. xxx (1899), t. 31, f. 12, 13 (seedling).
Carmichaelia Enysii, T. Kirk—Trans. N.Z. Inst. xvi (1884), t. 30; Cockayne, Trans. N.Z. Inst. xxxii (1900), t. 9, f. 16, 17.
Carmichaelia Enysii, var. *orbiculata*, T. Kirk—Cockayne, Rept. Tong. Nat. Park, t. 20; N.Z. Pl. t. 64.
Carmichaelia uniflora, T. Kirk—Trans. N.Z. Inst. xvi (1884), t. 31.
Carmichaelia Williamsii, T. Kirk—Trans. N.Z. Inst. xvi (1884), t. 32; Featon, Art Alb. N.Z. Fl. t. 26, f. 3. (Flowers coloured yellow by error.)
Carmichaelia australis, R. Br.—Bot. Reg. xi (1825), t. 912; Raoul, Choix, t. 28b (*C. Cunninghamii*); Laing & Blackw. Pl. N.Z. t. 61, 62.
Carmichaelia Petriei, T. Kirk, var. *robusta*, Cheesem.—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 30, f. 5, 5a, 9, and t. 33, f. 30.
Carmichaelia odorata, Col.—Featon, Art Alb. N.Z. Fl. t. 26, f. 1; Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 32, f. 24 (seedling).

- Carmichaelia angustata*, T. Kirk—Cockayne. Trans. N.Z. Inst. xxxii (1900), t. 8, f. 1, 2.
Carmichaelia flagelliformis, Col.—Featon, Art Alb. N.Z. Fl. t. 26, f. 2.
Carmichaelia flagelliformis, var. *Hookeri*, Cheesem.—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 30, f. 6, 7, 8.
Carmichaelia gracilis, Armstr.—Ic. Plant. t. 1332 (*C. Kirkii*); Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 30, f. 1, 2 (seedling).
Notospartium Carmichaeliae, Hook. f.—Kew Journ. Bot. ix, t. 3; Bot. Mag. t. 6741; Gard. Chron. 1883, ii, t. 26; 1907, ii, t. 60, 61; Featon, Art Alb. N.Z. Fl. t. 26, f. 4.
Clanthus puniceus, Banks & Sol.—Lindl. in Bot. Reg. t. 1775; Featon, Art Alb. N.Z. Fl. t. 27; Laing & Blackw. Pl. N.Z. t. 63.
Sophora tetraptera, Mill. var. *grandiflora*, Hook. f.—Bot. Mag. t. 167; T. Kirk, Forest Fl. t. 50; Featon, Art Alb. N.Z. Fl. t. 28; Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 34, f. 71, 72.
Sophora tetraptera, var. *microphylla*, Hook. f.—Bot. Mag. t. 1442 (*S. microphylla*), and t. 3735 (*Edwardsia Macnabiana*); Gard. Chron. 1878, i, f. 126; Laing & Blackw. Pl. N.Z. t. 64, 65; T. Kirk, Forest Fl. t. 51; Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 32, f. 25.
Sophora tetraptera, var. *prostrata*, T. Kirk—Buch. Trans. N.Z. Inst. xvi (1884), t. 36; T. Kirk, Forest Fl. t. 52.

ROSACEÆ.

- Rubus australis*, Forst.—Hook. f. Fl. Nov. Zel. i, t. 14 (var. *glaber*); Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 32, f. 21, and t. 34, f. 67-68 (seedling).
Rubus cissoides, A. Cunn. var. *pauperatus*, T. Kirk—Laing & Blackw. Pl. N.Z. t. 59; Cockayne, Trans. N.Z. Inst. xxxiii (1901), t. 12, f. 39, 40, 43-45; Kerner, Nat. Hist. Pl. t. 158 (*R. squarrosus*).
Rubus pareus, Buch.—Trans. N.Z. Inst. vi (1874), t. 22, f. 2, 3; Featon, Art Alb. N.Z. Fl. t. 29, f. 3.
Geum urbanum, Linn. var. *strictum*, Hook. f.—Featon, Art Alb. N.Z. Fl. t. 29, f. 4.
Geum albidiflorum, Cheesem.—Hook. f. Fl. Antaret. i, t. 7 (*Sieversia albiflora*).
Acaena sanguisorbæ, Vahl.—Forst. Char. Gen. t. 2 (*Ancistrum anserinaefolium*); Homb. & Jacq. Voy. au Pole Sud, t. 24B; Featon, Art Alb. N.Z. Fl. t. 29, f. 5.
Acaena sanguisorbæ, Vahl. var. *pilosa*, T. Kirk—Gaertn. Fruct. i, t. 32 (*Ancistrum decumbens*).
Acaena ascendens, Vahl.—Hook. f. Fl. Antaret. iii, t. 96; Homb. & Jacq. Voy. au Pole Sud, t. 25, f. C.
Acaena glabra, Buch.—Trans. N.Z. Inst. iv (1872), t. 14.

SAXIFRAGACEÆ.

- Donatia novæ-zealandiæ*, Hook. f.—Fl. Nov. Zel. i, t. 20; Engl. in Pflanzenf. iii, abt. 2, t. 31, D-F; Milbraed in Engl. Pflanzenr. heft 35, t. 7, f. D-F.
Quintinia serrata, A. Cunn.—Ic. Plant. t. 558; T. Kirk, Forest Fl. t. 125; Hetley, Nat. Fl. N.Z. t. 33; Featon, Art Alb. N.Z. Fl. t. 30, f. 1, 2.
Quintinia acutifolia, T. Kirk—Forest Fl. t. 125, f. 6, 7.
Iserba brezioides, A. Cunn.—Ic. Plant. t. 577-578; T. Kirk, Forest Fl. t. 48; Engl. in Pflanzenf. iii, abt. 2, t. 44; Featon, Art Alb. N.Z. Fl. t. 30, f. 3; Laing & Blackw. Pl. N.Z. t. 54.
Carpodetus serratus, Forst.—Char. Gen. t. 17; Ic. Plant. t. 564; T. Kirk, Forest Fl. t. 47; Featon, Art Alb. N.Z. Fl. t. 30, f. 3; Laing & Blackw. Pl. N.Z. t. 55.
Ackama rosæfolia, A. Cunn.—A. Gray, Bot. U.S. Expl. Exped. t. 84 (*Weinmannia*); T. Kirk, Forest Fl. t. 63.
Weinmannia sylvicola, Soland.—T. Kirk, Forest Fl. t. 72; Featon, Art Alb. N.Z. Fl. t. 32, f. 1.
Weinmannia racemosa, Linn. f.—T. Kirk, Forest Fl. t. 73; Featon, Art Alb. N.Z. Fl. t. 32, f. 2; Cockayne, Rept. Bot. Stew. Is. t. 10.

CRASSULACEÆ.

- Tillæa moschata*, D.C.—Ic. Plant. t. 535.
Tillæa Sieberiana, Schultz—Ic. Plant. t. 295 (*T. verticillaris*).

DROSERACEÆ.

- Drosera stenopetala*, Hook. f.—Fl. Nov. Zel. i, t. 9; Drude in Engl. Pflanzenf. iii, abt. 2, t. 159, f. A-C; Diels in Pflanzenr. heft 26, t. 21, f. J-L.
Drosera Arcturi, Hook.—Ic. Plant. t. 56; Featon, Art Alb. N.Z. Fl. t. 33, f. 1; Diels in Pflanzenr. heft 26, t. 21, f. A-F.
Drosera pygmaea, D.C.—Diels in Pflanzenr. heft 26, t. 22.
Drosera spathulata, Lab.—Pl. Nov. Holl. i, t. 106, f. 1; Bot. Mag. t. 5240; Laing & Blackw. Pl. N.Z. t. 53; Diels in Pflanzenr. heft 26, t. 31, f. A-B.
Drosera binata, Lab.—Pl. Nov. Holl. i, t. 105; Bot. Mag. t. 3082; Featon, Art Alb. N.Z. Fl. t. 33, f. 2; Diels in Pflanzenr. heft 26, t. 34.
Drosera auriculata, Backh.—Lab. Pl. Nov. Holl. i, t. 106 (*D. peltata*); Featon, Art Alb. N.Z. Fl. t. 33, f. 3; Diels in Pflanzenr. heft 26, t. 36, f. D-G.

HALORAGACEÆ.

- Haloragis erecta*, Schindl.—Pflanzenr. heft 23, t. 14, f. A-D; Murr. in Comm. Gotting. iii, t. 1 (*Cercodia*)
 Featon, Art. Alb. N.Z. Fl. t. 33, f. 4 (*H. alata*); Peterson in Engl. Pflanzenf. in, abt. 7, t. 102, f. A-C
 (*H. alata*).
Haloragis incana, Walp.—Schindl. in Pflanzenr. heft 23, t. 9, f. D, E (*H. aggregata*).
Haloragis depressa, Walp.—Buch. Trans. N.Z. Inst. iv (1872), t. 13 (*H. aggregata*).
Haloragis depressa, var. *uniflora*, Cheesem.—Schindl. in Pflanzenr. heft 23, t. 13, f. B (*H. uniflora*).
Haloragis depressa, var. *spicata*, Schindl.—Petric in Trans. N.Z. Inst. xxxi (1899), t. 27 (*H. spicata*).
Haloragis micrantha, R. Br.—Brong. in Duper. Voy. Coq. Bot. t. 68 (*H. tenella*); Peterson in Engl.
 Pflanzenf. iii, abt. 7, t. 102, f. D, E; Schindl. in Pflanzenr. heft 23, t. 12, f. A-D.
Myriophyllum elatinoide, Gaud.—Schindl. in Pflanzenr. heft 23, t. 26, f. A-B.
Myriophyllum intermedium, D.C.—Ic. Plant. t. 289 (*M. variifolium*).
Myriophyllum pedunculatum, Hook. f.—Fl. Tasm. i, t. 286.
Gunnera monoica, Raulin—Choix, t. 8; Peterson in Engl. Pflanzenf. iii, abt. 7, t. 106B.
Gunnera dentata, T. Kirk—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 34, f. 48 (seedling).

MYRTACEÆ.

- Leptospermum scoparium*, Forst.—Char. Gen. t. 36; T. Kirk, Forest Fl. t. 117; Featon, Art. Alb. N.Z.
 Fl. t. 34; Laing & Blackw. Pl. N.Z. t. 85, 86.
Leptospermum ericoides, A. Rich.—T. Kirk, Forest Fl. 69; Laing & Blackw. Pl. N.Z. t. 87.
Metrosideros florida, Sm.—Bot. Mag. t. 4471; Hook. f. Fl. Nov. Zel. i, t. 15; T. Kirk, Forest Fl. t. 127;
 Hetley, Nat. Fl. N.Z. t. 16; Featon, Art. Alb. N.Z. Fl. t. 35, f. 1.
Metrosideros lucida, A. Rich.—Cav. Ic. iv, t. 337 (*M. umbellata*); Homb. & Jacq. Voy. Astrol. et Zél.
 Phan. t. 1 (*Agalmanthus umbellatus*); T. Kirk, Forest Fl. t. 58; Hetley, Nat. Fl. N.Z. t. 6; Featon,
 Art. Alb. N.Z. Fl. t. 35, f. 2; Cockayne in Rept. Subantarct. Is. of N.Z. p. 193, f. 4.
Metrosideros Parkinsoni, Buch.—Trans. N.Z. Inst. xv (1883), t. 28, f. 2.
Metrosideros albiflora, Sol.—Gaertn. Fruct. t. 34, f. 11; Ic. Plant. t. 569 (*M. diffusa*); Hetley, Nat. Fl.
 N.Z. t. 18; Featon, Art. Alb. N.Z. Fl. t. 35, f. 3.
Metrosideros hypericifolia, A. Cunn.—Hook. f. Fl. Nov. Zel. i, t. 16; Laing & Blackw. Pl. N.Z. t. 89.
Metrosideros robusta, A. Cunn.—Hook. f. Fl. Nov. Zel. i, t. 17; Bot. Mag. t. 4471 (*M. florida*); T. Kirk,
 Forest Fl. t. 128; Laing & Blackw. Pl. N.Z. t. 88, 90.
Metrosideros tomentosa, A. Rich.—Fl. Nouv. Zel. t. 37; Bot. Mag. t. 4488; T. Kirk, Forest Fl. t. 118;
 Hetley, Nat. Fl. N.Z. t. 29; Featon, Art. Alb. N.Z. Fl. t. 37; Laing & Blackw. Pl. N.Z. t. 91;
 Cockayne, N.Z. Pl. t. 36.
Metrosideros villosa, Sm.—Gaud. in Freye. Voy. Bot. t. 85; T. Kirk, Forest Fl. t. 119 (*M. polymorpha*).
Metrosideros scandens, Sol.—Gaertn. Fruct. i, t. 34, f. 10; Bot. Mag. t. 4515 (*M. buxifolia*); Paxt.
 Fl. Gard. i, f. 56 (*M. buxifolia*); Laing & Blackw. Pl. N.Z. t. 92.
Myrtus bullata, Sol.—Ic. Plant. t. 557; Bot. Mag. t. 4809; T. Kirk, Forest Fl. t. 131; Featon, Art.
 Alb. N.Z. Fl. t. 38, f. 1, 2.
Myrtus Ralphii, Hook. f.—T. Kirk, Forest Fl. t. 91.
Myrtus oboordata, Hook. f.—T. Kirk, Forest Fl. t. 70; Featon, Art. Alb. N.Z. Fl. t. 38, f. 3.
Myrtus pedunculata, Hook. f.—Ic. Plant. t. 629; T. Kirk, Forest Fl. t. 112; Featon, Art. Alb. N.Z.
 Fl. t. 38, f. 4.
Eugenia Maire, A. Cunn.—T. Kirk, Forest Fl. t. 122; Featon, Art. Alb. N.Z. Fl. t. 39.

ONAGRACEÆ.

- Epilobium pallidiflorum*, Sol.—Ic. Plant. t. 297 (*E. macranthum*).
Epilobium chionanthum, Haussk.—Monog. Epilob. t. 22, f. 92, A and B.
Epilobium pubens, A. Rich.—Fl. Nouv. Zel. t. 36.
Epilobium confertifolium, Hook. f.—Ic. Plant. t. 685.
Epilobium confertifolium, var. *tasmanicum*, Cheesem.—Haussk. Monog. Epilob. t. 20, f. 84 (*E. tasmanicum*).
Epilobium tenuipes, Hook. f.—Haussk. Monog. Epilob. t. 20, f. 83.
Epilobium Hectori, Haussk.—Monog. Epilob. t. 19, f. 82, 82A.
Epilobium alsinoides, A. Cunn.—Haussk. Monog. Epilob. t. 23, f. 97.
Epilobium chlorafolium, Haussk.—Monog. Epilob. t. 19, f. 81, 81A; Cockayne, N.Z. Pl. t. 63.
Epilobium linnæoides, Hook. f.—Fl. Antart. i, t. 6.
Epilobium nummularifolium, R. Cunn.—Haussk. Monog. Epilob. t. 22, f. 94.
Epilobium nummularifolium, var. *pedunculare*, Hook. f.—Haussk. Monog. Epilob. t. 23, f. 96; Ic. t. 20,
 f. 85 (*E. cæspitosum*).
Epilobium purpuratum, Hook. f.—Barbey. Gen. Epilob. t. 18, f. 2.
Epilobium macropus, Hook.—Ic. Plant. t. 812; Haussk. Monog. Epilob. t. 21, f. 91, 91A, 1B;
 Cockayne, Rept. Tong. Nat. Park, t. 23.
Epilobium crassum, Hook. f.—Haussk. Monog. Epilob. t. 22, f. 93, 93A; Barbey, Gen. Epilob. t. 18,
 f. 1.
Epilobium brevipes, Hook. f.—Haussk. Monog. Epilob. t. 21, f. 89; Barbey, Gen. Epilob. t. 19.
Epilobium pycnostachyum, Haussk. Monog. Epilob. t. 21, f. 88.

- Epilobium melanocaulon*, Hook.— *Ic. Plant.* t. 813.
Epilobium melanocaulon, var. *polyclonum*, Cheesem.—*Haussk. Monog. Epilob.* t. 20, f. 87, 87A.
Epilobium microphyllum, A. Rich.—*Fl. Nouv. Zel.* t. 36; *Haussk. Monog. Epilob.* t. 18, f. 79.
Epilobium Krullianum, Haussk.—*Monog. Epilob.* t. 23, f. 95.
Epilobium glabellum, Forst. var. *erubescens*, Haussk.—*Monog. Epilob.* t. 23, f. 98, 98A, 98B.
Epilobium novæ-zelandiæ, Haussk.—*Monog. Epilob.* t. 20, f. 86, 86A, 86B.
Fuchsia exorticata, Linn. f.—*Lindl. in Bot. Reg.* t. 857; *Forst. Char. Gen.* t. 29 (*Skinnera*); *T. Kirk, Forest Fl.* t. 36, 36A; *T. Kirk, Trans. N.Z. Inst.* xxv (1893), t. 19; *Laing & Blackw. Pl. N.Z.* t. 94.
Fuchsia procumbens, R. Cunn.— *Ic. Plant.* t. 421; *Gard. Chron.* 1874, ii, t. 60; *Ic. Plant.* t. 1083 (*F. Kirkii*); *Bot. Mag.* t. 6139; *Hetley, Nat. Fl. N.Z.* t. 19.

PASSIFLORACEÆ.

- Passiflora tetrandra*, Banks & Sol.—*Raoul, Choix.* t. 27 (*Tetraphæa australis*); *Laing & Blackw. Pl. N.Z.* t. 83.

FICOIDEÆ.

- Mesembryanthemum australe*, Sol.—*Cockayne, N.Z. Pl.* t. 25.

UMBELLIFERÆ.

- Hydrocotyle tripartita*, R. Br.—*A. Rich. Hydrocot.* t. 61, f. 25, and t. 61, f. 27 (*H. muscosa*).
Hydrocotyle tripartita, F. Muell.—*Hook. f. Fl. Tasm.* i, t. 33, B, C; *Drude in Engl. Pflanzenf.* iii, abt. 8, t. 47, F-H.
Hydrocotyle asiatica, Linn.— *Ic. Plant.* t. 303 (*H. cordifolia*); *Drude in Engl. Pflanzenf.* iii, abt. 8, t. 47, J.
Azorella Selago, Hook. f.—*Fl. Antaret.* ii, t. 99.
Schizoclema exiguum, Domin.—*Buch. Trans. N.Z. Inst.* xiv (1882), t. 26, f. 2 (*Azorella exigua*).
Schizoclema reniforme, Domin.—*Hook. f. Fl. Antaret.* i, t. 11 (*Pozoa reniformis*).
Schizoclema trifoliolatum, Domin.—*Hook. f. Fl. Nov. Zel.* i, t. 18 (*Pozoa trifoliolata*).
Eryngium vesiculosum, Lab.—*Pl. Nov. Holl.* i, t. 98.
Actinotus novæ-zelandiæ, Petrie—*Hook. f. Fl. Tasm.* i, t. 36A (*Hemiphys bellidioides*, var. *suffocata*).
Apium prostratum, Lab.—*Pl. Nov. Holl.* i, t. 103; *Ic. Plant.* t. 305 (*Petroselinum*).
Apium prostratum, var. *filiforme*, Cheesem.— *Ic. Plant.* t. 819 (*A. filiforme*).
Oreomyrrhis andicola, Endl.—*Hook. f. Fl. Antaret.* ii, t. 101 (South American specimen).
Crantzia lineata, Nutt.—*Hook. f. Fl. Antaret.* ii, t. 100 (American specimen).
Aciphylla Colensoi, Hook. f.—*Lindsay, Contr. N.Z. Bot.* t. 1; *Laing & Blackw. Pl. N.Z.* t. 103.
Aciphylla squarrosa, Forst.—*Char. Gen.* t. 68; *Ic. Plant.* t. 607-608; *Gard. Chron.* 1884, ii, t. 26, and 1911, ii, t. 52.
Aciphylla Lyallii, Hook. f.— *Ic. Plant.* t. 2556.
Aciphylla Hectors, Buch.—*Trans. N.Z. Inst.* xiv (1882), t. 27.
Aciphylla Kirkii, Buch.—*Trans. N.Z. Inst.* xix (1887), t. 17.
Aciphylla Monroi, Hook. f.—*Laing & Blackw. Pl. N.Z.* t. 104.
Cocella Dieffenbachii, Cheesem.—*Muell. Veg. Chath. Is.* t. 1 (*Gingidium*); *Dorrien-Smith in Kew Bull.* 1910, p. 124.
Ligusticum latifolium, Hook. f.—*Fl. Antaret.* i, t. 8 (*Anisotome*); *Cockayne in Rept. Subantaret. Is. N.Z.* i, p. 197, f. 6 (*Aciphylla*).
Ligusticum antipodum, Homb. & Jacq.—*Voy. Astrol. et Zél.* t. 3; *Hook. f. Fl. Antaret.* i, t. 9, 10 (*Anisotome*).
Ligusticum dissectum, T. Kirk—*Aston, Trans. N.Z. Inst.* xlii (1910), t. 5.
Ligusticum filifolium, Hook. f.—*Cockayne, Trans. N.Z. Inst.* xxxiii (1901), t. 12, f. 38, 41.
Ligusticum piliferum, Hook. f.—*Laing & Blackw. Pl. N.Z.* t. 102.
Angelica Gingidium, Hook. f.—*Forst. Char. Gen.* t. 21 (*Gingidium montanum*).
Angelica geniculata, Hook. f.—*Fl. Nov. Zel.* i, t. 19 (*Eustylis*); *Spreng. Umbellif.* t. 5 (*Bowlesia*).
Angelica roseifolia, Hook.— *Ic. Plant.* t. 581.
Daucus brachiatus, Sieb.—*Lab. Pl. Nov. Holl.* i, t. 102 (*Scandix glochidiata*).

ARALIACEÆ.

- Stilbocarpa polaris*, A. Gray—*Homb. & Jacq. Voy. Astrol. et Zél.* t. 2 (*Aralia*); *Ic. Plant.* t. 747; *T. Kirk, Trans. N.Z. Inst.* xvii (1885), t. 17; *Laing & Blackw. Pl. N.Z.* t. 96; *Kew Bull.* 1908 p. 249; *Cockayne in Rept. Subantaret. Is. N.Z.* i, p. 189, f. 3.
Stilbocarpa Lyallii, Armstr.—*T. Kirk, Trans. N.Z. Inst.* xvii (1885), t. 17 (*Aralia*); *Cockayne, Trans. N.Z. Inst.* xxxvi (1904), t. 21; *Rept. Bot. Stew. Is.* t. 38.
Panax simplex, Forst.—*A. Rich. Fl. Nouv. Zel.* t. 31; *Homb. & Jacq. Voy. Astrol. et Zél.* t. 30, f. B; *Hook. f. Fl. Antaret.* i, t. 12; *T. Kirk, Forest Fl.* t. 106, 107; *Cockayne, Trans. N.Z. Inst.* xxxvi (1904), t. 11.

- Panax Edgerleyi*, Hook. f.—T. Kirk, Forest Fl. t. 11, 45, 15B; Phillips Turner, Rept. Waimarino, p. 10.
Panax anomalum, Hook.—Lond. Journ. Bot. ii (1843), t. 12.
Panax Colensoi, Hook. f.—Fl. Nov. Zel. i, t. 21; Laing & Blackw. Pl. N.Z. t. 97 (*Nothopanax*).
Panax arboreum, Forst.—Hook. in Lond. Journ. Bot. ii (1843), t. 11; Phillips Turner, Rept. Waimarino, p. 10.
Meryta Sinclairii, Seem.—T. Kirk, Forest Fl. t. 121; Hetley, Nat. Fl. N.Z. t. 25; Laing & Blackw. Pl. N.Z. t. 100; Gard. Chron. 1903, vol. 31, f. 122, and 1908, vol. 1, f. 2.
Schefflera digitata, Forst.—Char. Gen. t. 23; Hook. f. Fl. Nov. Zel. i, t. 22 (*Aralia Schefflera*); Laing & Blackw. Pl. N.Z. t. 101.
Pseudopanax Lessonii, C. Koch—A. Rich. Fl. Nouv. Zel. t. 32 (*Cussonia*).
Pseudopanax crassifolium, C. Koch—Ic. Plant. t. 583, 584 (*Panax*); Buch. Trans. N.Z. Inst. ix (1877), t. 21 (*Panax longissimum*); T. Kirk, Forest Fl. t. 38, 38A, 38B, 38C, 38D; Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 32, f. 22, and t. 33, f. 31–35 (development of seedling); Laing & Blackw. Pl. N.Z. t. 98, 99; Phillips Turner, Rept. Waimarino, p. 9.
Pseudopanax ferox, T. Kirk—Buch. Trans. N.Z. Inst. ix (1877), t. 20 (*P. crassifolium*); T. Kirk, Forest Fl. t. 23–26.
Pseudopanax Chathamicum, T. Kirk—Cockayne, Trans. N.Z. Inst. xxxii (1900), t. 9, f. 11–15 and 23, 24 (development of seedling).

CORNACEÆ.

- Corokia buddleoides*, A. Cunn.—Ic. Plant. t. 424.
Corokia macrocarpa, T. Kirk—Wangerin in Pflanzenr. heft 41, t. 21, f. A–C.
Corokia cotoneaster, Raoul—Choix, t. 20; Wangerin in Pflanzenr. heft. 41, t. D–J.
Griselinia lucida, Forst.—Char. Gen. t. 70; T. Kirk, Forest Fl. t. 41.
Griselinia littoralis, Raoul—Choix, t. 19; T. Kirk, Forest Fl. t. 42.

CAPRIFOLIACEÆ.

- Alseuosmia macrophylla*, A. Cunn.—Hook. f. Fl. Nov. Zel. i, t. 23; Bot. Mag. t. 6951; Hetley, Nat. Fl. N.Z. t. 19.
Alseuosmia Banksii, A. Cunn.—Hook. f. Fl. Nov. Zel. i, t. 24.
Alseuosmia linariifolia, A. Cunn.—Hook. f. Fl. Nov. Zel. i, t. 25.

RUBIACEÆ.

- Coprosma lucida*, Forst.—Char. Gen. t. 69, f. H–K; Laing & Blackw. t. 132; Greensill, Trans. N.Z. Inst. xxxv (1903), t. 41, f. 5, and t. 42, f. 6, 7, 9, 10, 11.
Coprosma Baueri, Endl.—Iconog. t. 111; T. Kirk, Forest Fl. t. 62; Barbier in Rev. Hort. Belg. iii (1877), t. 12 (*C. Stockii*); Greensill, Trans. N.Z. Inst. xxxv (1903), t. 41, f. 1–4.
Coprosma Chathamica, Cockayne—Greensill, Trans. N.Z. Inst. xxxv (1903), t. 42, f. 13, and t. 43, f. 16.
Coprosma robusta, Raoul—Choix, t. 21; Greensill, Trans. N.Z. Inst. xxxv (1903), t. 44, f. 20, 25.
Coprosma arborea, T. Kirk—Forest Fl. t. 132; Laing & Blackw. Pl. N.Z. t. 133.
Coprosma spathulata, A. Cunn.—Laing & Blackw. t. 134 (*C. tenuicaulis*).
Coprosma rotundifolia, A. Cunn.—Greensill, Trans. N.Z. Inst. xxxv (1903), t. 44, f. 21, 26.
Coprosma acerosa, A. Cunn.—Gard. Chron. 1909, ii, f. 150; Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 34, f. 69 (stipule); Cockayne, N.Z. Pl. t. 31.
Coprosma propinqua, A. Cunn.—Greensill, Trans. N.Z. Inst. xxxv (1903), t. 42, f. 8, and t. 44, f. 22.
Coprosma Kirkii, Cheesem.—Buch. Trans. N.Z. Inst. xvi (1884), t. 34, f. 1 (*Clagianthus linariifolius*).
Coprosma linariifolia, Hook. f.—T. Kirk, Forest Fl. t. 95; Greensill, Trans. N.Z. Inst. xxxv (1903), t. 43, f. 14, and t. 44, f. 23.
Coprosma fetidissima, Forst.—Char. Gen. t. 69, f. A–G; Hook. f. Fl. Antart. i, t. 13, and t. 14 (*C. affinis*); Greensill, Trans. N.Z. Inst. xxxv (1903), t. 43, f. 15, and t. 44, f. 24.
Coprosma cuneata, Hook. f.—Fl. Antart. i, t. 15.
Coprosma repens, Hook. f.—Fl. Antart. i, t. 16.
Nertera depressa, Banks & Sol.—Gaertn. Fruct. i, t. 26; Bot. Mag. t. 4809; Schum. in Engl. Pflanzenf. iv, abt. 4, t. 42, A, B.
Nertera dichondraefolia, Hook. f.—Fl. Nov. Zel. i, t. 28A; Laing & Blackw. Pl. N.Z. t. 135.
Nertera setulosa, Hook. f.—Fl. Nov. Zel. i, t. 28B.

COMPOSITÆ.

- Lagenophora punila*, Forst.—A. Rich. Fl. Nouv. Zel. t. 30 (*Microcalia australis*).
Brachycome Thomsoni, T. Kirk—Trans. N.Z. Inst. xvi (1884), t. 27.
Olearia insignis, Hook. f.—Hetley, Nat. Fl. N.Z. t. 35; Bot. Mag. t. 7034; Laing & Blackw. Pl. N.Z. t. 137; Gard. Chron. 1908, i, t. 3, and 1911, i, t. 28.
Olearia semidentata, Dcne.—Buch. Trans. N.Z. Inst. vii (1875), t. 14; Hetley, Nat. Fl. N.Z. t. 2; Cockayne, Trans. N.Z. Inst. xxxiv (1902), t. 18; Kew Bull. 1910, p. 122, 123, and p. 125 (var. *albiflora*); Gard. Chron. 1911, i, Jan. 28.

- Olearia chathamica*, T. Kirk—Buch. Trans. N.Z. Inst. vii (1875), t. 15 (*O. angustifolia*, var.).
Olearia angustifolia, Hook. f.—T. Kirk, Forest Fl. t. 138; Cockayne, N.Z. Pl. t. 34, 35; Cockayne, Rept. Bot. Stew. Is. t. 15.
Olearia Trallii, T. Kirk—Forest Fl. t. 142.
Olearia Colensoi, Hook. f.—Fl. Nov. Zel. i, t. 29; T. Kirk, Forest Fl. t. 102.
Olearia Lyallii, Hook. f.—Cockayne, Trans. N.Z. Inst. xxvi (1904), t. 15; Cockayne, Subantarct. Repts. i, 208, f. 8.
Olearia Traversii, Hook. f.—F. Muell. Veg. Chat. Is. t. 2 (*Eurybia*); T. Kirk, Forest Fl. t. 34; Gard. Chron. 1887, ii, t. 42.
Olearia furfuracea, Hook. f.—Laing & Blackw. Pl. N.Z. t. 138.
Olearia macrodonta, Baker—Gard. Chron. 1886, ii, t. 62, and 1911, i, t. 29; Bot. Mag. t. 7065.
Olearia ilicifolia, Hook. f.—Hetley, Nat. Fl. N.Z. t. 21; Laing & Blackw. Pl. N.Z. t. 139.
Olearia Cunninghamii, Hook. f.—Fl. Nov. Zel. i, t. 30 (*Eurybia*); T. Kirk, Forest Fl. t. 114.
Olearia Haastii, Hook. f.—Gard. Chron. 1872, p. 1195; Bot. Mag. t. 6592; Gard. Chron. 1896, ii, t. 96, and 1911, i, t. 27.
Olearia nummularifolia, Hook. f.—Laing & Blackw. Pl. N.Z. t. 140; Cockayne, Rept. Tong. Nat. Park, t. 19; Cockayne, N.Z. Pl. t. 23.
Olearia avicenniifolia, Hook. f.—T. Kirk, Forest Fl. t. 111.
Olearia Forsteri, Hook. f.—Forst. Char. Gen. t. 48 (*Shawia paniculata*); Raoul, Choix, t. 13 (*Shawia paniculata*); T. Kirk, Forest Fl. t. 137; Laing & Blackw. Pl. N.Z. t. 142; Gard. Chron. 1897, ii, p. 381, and 1911, i, t. 26.
Olearia odorata, Petrie—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 33 (seedling).
Olearia virgata, Hook. f.—Laing & Blackw. Pl. N.Z. t. 141.
Pleurophyllum speciosum, Hook. f.—Fl. Antart. i, t. 22, 23; Laing & Blackw. Pl. N.Z. t. 143; Cockayne, Subantarct. Repts. i, 222, f. 14.
Pleurophyllum criniferum, Hook. f.—Fl. Antart. i, t. 24, 25; Homb. & Jacq. Voy. Astrol. et Zél. t. 4 (*Albinea orisegenesa*); Cockayne, Subantarct. Repts. i, 222, f. 15.
Pleurophyllum Hookeri, Buch.—T. Kirk, Trans. N.Z. Inst. xxiii (1891), t. 39, 40 (*P. Hookerianum*); Cockayne, Subantarct. Repts. i, 221, f. 13.
Celmisia Walkeri, T. Kirk—Trans. N.Z. Inst. ix (1877), t. 30.
Celmisia lateralis, Buch.—Trans. N.Z. Inst. iv (1872), t. 15.
Celmisia holosericea, Hook. f.—Fl. Nov. Zel. i, t. 31.
Celmisia Dallii, Buch.—Trans. N.Z. Inst. xiv (1882), t. 35.
Celmisia hieracifolia, Hook. f.—Fl. Nov. Zel. i, t. 34b.
Celmisia discolor, Hook. f.—Buch. Trans. N.Z. Inst. xvii (1885), t. 15 (*Erigeron novæ-zealandiæ*).
Celmisia incana, Hook. f.—Fl. Nov. Zel. i, t. 34a; Buch. Trans. N.Z. Inst. xix (1887), t. 18 (*C. robusta*).
Celmisia Lindsayi, Hook. f.—Lindsay, Contr. N.Z. Bot. t. 3, f. 1; Bot. Mag. t. 7134.
Celmisia cordatifolia, Buch.—Trans. N.Z. Inst. xi (1879), t. 18.
Celmisia spectabilis, Hook. f.—Fl. Nov. Zel. i, t. 33; Bot. Mag. t. 6653; Gard. Chron. 1906, ii, t. 1, and 1909, i, t. 1; Cockayne, Rept. Tong. Nat. Park, t. 21.
Celmisia Mackayi, Raoul—Choix, t. 14.
Celmisia coriacea, Hook. f.—Fl. Nov. Zel. i, t. 32; Gard. Chron. 1902, ii, t. 65, and 1906, ii, t. 2; Laing & Blackw. Pl. N.Z. t. 144, 145.
Celmisia Armstrongii, Petrie—Hetley, Nat. Fl. N.Z. t. 15 (*C. Monroii*).
Celmisia Monroii, Hook. f.—Bot. Mag. t. 7496 (probably not the true plant).
Celmisia longifolia, Cass.—Hetley, Nat. Fl. N.Z. t. 21; Laing & Blackw. Pl. N.Z. t. 146.
Celmisia linearis, Armstr.—Cockayne, Rept. Bot. Stew. Is. t. 9.
Celmisia glandulosa, Hook. f.—Hetley, Nat. Fl. N.Z. t. 21 (?).
Celmisia vernicosa, Hook. f.—Fl. Antart. i, t. 26, 27; Gard. Chron. 1891, i, t. 117.
Celmisia Campbellensis, Chapm.—Gard. Chron. 1891, i, f. 146 (*C. Chapmanii*).
Haastia pulvinaris, Hook. f.—Ic. Plant. t. 1003; Low, Trans. N.Z. Inst. xxxii (1900), t. 17–19, 19A.
Haastia Sinclairii, Hook. f.—Ic. Plant. t. 1003.
Gnaphalium trinerve, Forst.—Laing & Blackw. Pl. N.Z. t. 147.
Gnaphalium Traversii, Hook. f. var. *Mackayi*, T. Kirk—Buch. Trans. N.Z. Inst. xiv (1882), t. 34, f. 2 (*Raoulia Mackayi*).
Gnaphalium collinum, Lab.—Pl. Nov. Holl. ii, t. 189.
Raoulia australis, Hook. f.—Raoul, Choix, t. 15; Laing & Blackw. Pl. N.Z. t. 148; Cockayne, Rept. Tong. Nat. Park, t. 3; Cockayne, N.Z. Pl. t. 5; Beauv. Bull. Soc. Bot. Geneva (1910), 220, fig. 4.
Raoulia lutescens, Beauv.—Bull. Soc. Bot. Geneva (1910), 222, fig. 5.
Raoulia tenuicaulis, Hook. f.—Fl. Nov. Zel. i, t. 36a; Beauv. Bull. Soc. Bot. Geneva (1910), 223, fig. 6.
Raoulia Haastii, Hook. f.—Beauv. Bull. Soc. Bot. Geneva (1910), 224, fig. 7.
Raoulia Monroii, Hook. f.—Beauv. Bull. Soc. Bot. Geneva (1912), 54, fig. 14, 9–18.
Raoulia Chesemani, Beauv.—Bull. Soc. Bot. Geneva (1912), 54, fig. 14, 1–8.
Raoulia glabra, Hook. f.—Beauv. Bull. Soc. Bot. Geneva (1910), 225, fig. 8.
Raoulia subsericea, Hook. f.—Beauv. Bull. Soc. Bot. Geneva (1910), 226, fig. 9.
Raoulia Parkii, Buch.—Trans. N.Z. Inst. xiv (1882), t. 34, f. 3.

- Raoulia subulata*, Hook. f.—Beauv. Bull. Soc. Bot. Geneva (1910), 228, fig. 10 (*Psychrophyton*).
Raoulia Youngii, Beauv.—Bull. Soc. Bot. Geneva (1910), 229, fig. 11 (*Psychrophyton*).
Raoulia eximia, Hook. f.—Hetley, Nat. Fl. N.Z. (special plate); Cockayne, Trans. N.Z. Inst. xxxii (1900), t. 11 and 12; Laing & Blackw. Pl. N.Z. t. 119 (*R. mammillaris*); Cockayne, N.Z. Pl. t. 47; Beauv. Bull. Soc. Bot. Geneva (1910), 231, fig. 12 (*Psychrophyton*).
Raoulia grandiflora, Hook. f.—Fl. Nov. Zel. i, t. 37A; Beauv. Bull. Soc. Bot. Geneva (1910), fig. 13 (*Psychrophyton*).
Raoulia Petriensis, T. Kirk—Beauv. Bull. Soc. Bot. Geneva (1912), 52, fig. 13.
Raoulia mammillaris, Hook. f.—Beauv. Bull. Soc. Bot. Geneva (1910), 233, fig. 11 (*Psychrophyton*).
Raoulia rubra, Buch.—Trans. N.Z. Inst. xiv (1882), t. 30, f. 2.
Raoulia Buchananii, T. Kirk—Beauv. Bull. Soc. Bot. Geneva (1912), 50, fig. 12.
Helichrysum bellidioides, Willd.—Hetley, Nat. Fl. N.Z. t. 31; Laing & Blackw. Pl. N.Z. t. 151; Cockayne, N.Z. Pl. t. 51.
Helichrysum bellidioides, var. *prostratum*, T. Kirk—Hook. f. Fl. Antaret. i, t. 21 (*H. prostratum*).
Helichrysum filicaule, Hook. f.—Fl. Nov. Zel. i, t. 36b.
Helichrysum fasciculatum, Buch.—Trans. N.Z. Inst. ix (1877), t. 19.
Helichrysum Loganii, T. Kirk—Buch. Trans. N.Z. Inst. xiv (1882), t. 30, f. 3 (*Haastia*).
Helichrysum glomeratum, Benth. & Hook. f.—Raoul. Choix, t. 16 (*Swammerdamia*); Paxt. Fl. Gard. ii, fig. 185 (*Swammerdamia*).
Helichrysum depressum, Benth. & Hook. f.—Hook. f. Fl. Nov. Zel. i, t. 35b (*Ozothamnus*); Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 34, f. 50, 51 (seedling).
Helichrysum microphyllum, Benth. & Hook. f.—Hook. f. Fl. Nov. Zel. i, t. 35A (*Ozothamnus*).
Leucogenes leontopodium, Beauv.—Bull. Soc. Bot. Geneva (1910), 242, fig. 18; Hook. f. Fl. Nov. Zel. i, 37b (*Helichrysum*); Aston, Trans. N.Z. Inst. xlii (1910), t. 6 (*Helichrysum*); Cockayne, N.Z. Pl. t. 50 (*Helichrysum*).
Leucogenes grandiceps, Beauv.—Bull. Soc. Bot. Geneva (1910), 244, fig. 19; Hetley, Nat. Fl. N.Z. t. 31 (*Helichrysum*); Laing & Blackw. Pl. N.Z. t. 152 (*Helichrysum*).
Cassinia leptophylla, R. Br.—Paxt. Fl. Gard. iii, f. 227.
Cassinia Vauvilliersii, Hook. f.—Homb. & Jacq. Bot. Voy. Astrol. et Zel. t. 5 (*Ozothamnus*); Laing & Blackw. Pl. N.Z. t. 152.
Craspedia uniflora, Forst.—Laing & Blackw. Pl. N.Z. t. 152.
Cotula coronopifolia, Linn. var. *integrifolia*, T. Kirk—Hook. f. Fl. Tasm. i, t. 50b (*C. integrifolia*).
Cotula australis, Hook. f.—Fl. Tasm. i, t. 50a.
Cotula plumosa, Hook. f.—Fl. Antaret. i, t. 20 (*Leptinella*).
Cotula lanata, Hook. f.—Fl. Antaret. i, t. 19 (*Leptinella*).
Cotula Muelleri, T. Kirk—F. Muell. Veg. Chath. Is. t. 6 (*Leptinella potentillina*).
Cotula Featherstonii, F. Muell.—Veg. Chath. Is. t. 5 (*Leptinella*); Cockayne, Trans. N.Z. Inst. xxxiv (1902), t. 16.
Abrotanella spathulata, Hook. f.—Fl. Antaret. i, t. 17 (*Trineuron*).
Abrotanella rosulata, Hook. f.—Fl. Antaret. i, t. 18 (*Ceratella*).
Abrotanella linearis, Berggr.—Minnesk. Fisiog. Salsk. Lund. viii (1877), t. 3, f. 28-38.
Abrotanella inconspicua, Hook. f.—Buch. Trans. N.Z. Inst. xiv (1882), t. 34, f. 1.
Abrotanella muscosa, T. Kirk—Trans. N.Z. Inst. xxiv (1892), t. 36.
Erechtites quadridenta, D.C.—Labill. Pl. Nov. Holl. ii, t. 194 (*Senecio*).
Brachyglottis repanda, Forst.—Char. Gen. t. 46; Hook. f. Fl. Nov. Zel. i, t. 40 (*Senecio Forsteri*); Gard. Chron. 1895, i, f. 110, and 1908, ii, f. 20, 21; Laing & Blackw. Pl. N.Z. t. 154.
Senecio lagopus, Raoul—Ann. Sci. Nat. ser. iii, 2 (1844), t. 18; and Choix, t. 17.
Senecio saxifragoides, Hook. f.—Laing & Blackw. Pl. N.Z. t. 157.
Senecio Lyallii, Hook. f.—Laing & Blackw. Pl. N.Z. t. 156.
Senecio laevis, Forst. var. *radiolatus*, T. Kirk—F. Muell. Veg. Chath. Is. t. 4 (*S. radiolatus*).
Senecio Hectori, Buch.—Trans. N.Z. Inst. vi (1874), t. 23; Hetley, Nat. Fl. N.Z. t. 20.
Senecio Kirkii, Hook. f.—Fl. Nov. Zel. i, t. 39 (*S. glastifolius*); Hetley, Nat. Fl. N.Z. t. 21 (*S. glastifolius*).
Senecio myrianthos, Cheesem.—Ic. Plant. t. 1201 (*S. Cheesemani*).
Senecio sciadophibus, Raoul—Choix, t. 18.
Senecio perdicoides, Hook. f.—Hetley, Nat. Pl. N.Z. t. 1.
Senecio Huntii, F. Muell.—Veg. Chath. Is. t. 3; Hetley, Nat. Fl. N.Z. t. 13.
Senecio laxifolius, Buch.—Bot. Mag. t. 7398; Gard. Chron. 1891, ii, t. 43 (spuhl. *S. latifolius*).
Senecio Greyii, Hook. f.—Fl. Nov. Zel. i, t. 38.
Senecio compactus, T. Kirk—Gard. Chron. 1896, ii, t. 53.
Senecio revolutus, T. Kirk—Buch. Trans. N.Z. Inst. vi (1874), t. 1. (*S. robustus*); Hetley, Nat. Fl. N.Z. t. 20 (*S. robustus*).
Senecio cassinioides, Hook. f.—Laing & Blackw. Pl. N.Z. t. 155.
Senecio elaeagnifolius, Hook. f.—Fl. Nov. Zel. i, t. 41 (*Brachyglottis*); Hetley, Nat. Fl. N.Z. t. 15.
Senecio rotundifolius, Hook. f.—T. Kirk, Forest Fl. t. 116; Cockayne, Rept. Bot. Stew. Is. t. 14; Cockayne, N.Z. Pl. t. 33.
Senecio geminatus, T. Kirk—Ic. Plant. t. 1002 (*Traversia baccharoides*).

- Microseris Forsteri*, Hook. f.—Fl. Tasm. i, t. 66.
Crepis novae-zelandiae, Hook. f.—Lindsay, Contr. N.Z. Bot. t. 3.
Taraxacum magellanicum, Comm.—Mazetti, Monog. Taraxac. t. 2, f. 7.

STYLIDIACEÆ.

- Phyllachne clavigera*, F. Muell.—Hook. f. Fl. Antart. i, t. 28 (*Forstera*); Homb. & Jacq. Bot. Voy. Astrol. et Zél. t. 16c (*Forstera aretriastriifolia*); Laing in Rept. Subantart. Is. N.Z. ii, p. 490, f. 2; Cockayne in Rept. Subantart. Is. N.Z. i, p. 196, f. 5; Milbraed in Pflanzenr. heft 35, t. 8, f. F-G.
Phyllachne Colensoi, Berggr.—Buch. Trans. N.Z. Inst. xiv (1882), t. 31, f. 1 (*P. Haastii*); Milbraed in Pflanzenr. heft 35, t. 8, f. A-E.
Phyllachne Colensoi, var. *Haastii*, Cheesem.—Berggr. in Minnesk. Fisiog. Sallsk. Lund. (1877) t. 3, f. 1-27 (*P. Colensoi*).
Phyllachne rubra, Cheesem.—Buch. Trans. N.Z. Inst. xiv (1882), t. 31, f. 2.
Oreostylidium subulatum, Berggr.—Minnesk. Fisiog. Sallsk. Lund. (1877) t. 1; Milbraed in Pflanzenr. heft 35, t. 9, f. A-E.
Forstera sedifolia, Linn. f.—Berggr. Minnesk. Fisiog. Sallsk. Lund. (1877) t. 2, f. 20.
Forstera sedifolia, Linn. f. var. *oculata*, Cheesem.—Milbraed in Pflanzenr. heft 35, t. 8, f. H-K.
Forstera Bidwillii, Hook. f.—Berggr. Minnesk. Fisiog. Sallsk. Lund. (1877) t. 2, f. 1-19; Hetley, Nat. Fl. N.Z. t. 21.
Forstera tenella, Hook. f.—Berggr. Minnesk. Fisiog. Sallsk. Lund. (1877) t. 2, f. 21-39; Milbraed in Pflanzenr. heft 35, t. 8, f. S-T.

GOODENIACEÆ.

- Selliera radicans*, Cav.—Ic. v, t. 474; Labill. Pl. Nov. Holl. i, t. 76 (*Goodenia repens*); Laing & Blackw. Pl. N.Z. t. 136; Schonland in Engl. Pflanzenf. iv, abt. 5, t. 46, f. A-D; Krause in Pflanzenr. heft 54, t. 22, f. A-E.

CAMPANULACEÆ.

- Colensoa physaloides*, Hook. f.—Ic. Plant. t. 555-556 (*Lobelia*); Bot. Mag. t. 6864; Ic. Plant. t. 1532 (*Pratia*).
Pratia arenaria, Hook. f.—Fl. Antart. i, t. 29.
Lobelia anceps, Linn. f.—Labill. Pl. Nov. Holl. i, t. 72 (*L. alata*).
Lobelia Roughii, Hook. f.—Buch. Trans. N.Z. Inst. xiv (1882), t. 28.
Isotoma fluviatilis, F. Muell.—Hook. f. Fl. Tasm. i, t. 70 (*Lobelia*).
Wahlenbergia saxicola, A. D.C.—Ic. Plant. t. 818 (*W. albomarginata*); Hook. f. Fl. Tasm. i, t. 71; Bot. Mag. t. 6613; Hetley, Nat. Fl. N.Z. t. 31.

ERICACEÆ.

- Gaultheria antipoda*, Forst.—A. Rich. Fl. Nouv. Zel. t. 28.
Gaultheria rupestris, R. Br.—A. Rich. Fl. Nouv. Zel. t. 27 (*Andromeda*); Hook. f. Fl. Nov. Zel. i, t. 42; Laing & Blackw. Pl. N.Z. t. 106.
Gaultheria oppositifolia, Hook. f.—Fl. Nov. Zel. i, t. 43.

EPACRIDACEÆ.

- Pentachondra pumila*, R. Br.—Forst. Char. Gen. t. 10, f. A-H (*Epacris*).
Cyathodes acerosa, R. Br.—Forst. Char. Gen. t. 10, f. N. (*Epacris*); T. Kirk, Forest Fl. t. 108; Laing & Blackw. Pl. N.Z. t. 109.
Cyathodes robusta, Hook. f.—Cockayne, N.Z. Pl. t. 58 (*Styphelia*).
Cyathodes empetrifolia, Hook. f.—Fl. Antart. i, t. 30 (*Androstoma*).
Leucopogon fasciculatus, A. Rich.—Laing & Blackw. Pl. N.Z. t. 105.
Leucopogon Richei, R. Br.—Bot. Mag. t. 3251.
Leucopogon Fraseri, A. Cunn.—Raoul, Choix, t. 12 (*L. Bellignianus*); Drude in Engl. Pflanzenf. iv, t. 47, f. A-C (*Styphelia*).
Epacris pauciflora, A. Rich.—Fl. Nouv. Zel. t. 29; Laing & Blackw. Pl. N.Z. t. 107.
Dracophyllum latifolium, A. Cunn.—T. Kirk, Forest Fl. t. 123.
Dracophyllum Menziesii, Hook. f.—Cockayne, Rept. Bot. Stew. Is. t. 7.
Dracophyllum longifolium, R. Br.—Forst. Char. Gen. t. 10, f. I-M (*Epacris*); Hook. f. Fl. Antart. t. 31, 32; Homb. & Jacq. Bot. Voy. Astrol. et Zél. t. 27, f. A, B (var. *retortum*); T. Kirk, Forest Fl. t. 109.
Dracophyllum Urrilleannum, A. Rich. var. *Lessonianum*—Homb. & Jacq. Bot. Voy. Astrol. et Zél. t. 27, bis, f. B (*D. Lessonianum*).
Dracophyllum scoparium, Hook. f.—Fl. Antart. i, t. 33.
Dracophyllum scoparium, Hook. f. var. *major*, Cheesem.—Cockayne, Trans. N.Z. Inst. xxxiv (1902), t. 19 (*D. arboreum*).

- Dracophyllum Kirkii*, Berggr.—Minnesk. Fisiog. Sällsk. Lund. (1877) t. 1, f. 1-11 (*D. uniflorum*).
Dracophyllum uniflorum, Hook. f.—Laing & Blackw. Pl. N.Z. t. 108.
Dracophyllum rosmarinifolium, R. Br. var. *politum*, Cheesem.—Cockayne, Rept. Bot. Stew. Is. t. 13 (*D. politum*).
Dracophyllum muscoides, Hook. f.—Buch. Trans. N.Z. Inst. xiv (1882), t. 26, f. 3.

PRIMULACEÆ.

- Samolus repens*, Pers.—Forst. Char. Gen. t. 9 (*Sheffieldia*).

MYRSINACEÆ.

- Myrsine salicina*, Heward—Hook. f. Fl. Nov. Zel. i, t. 44 (*Suttonia*) ; T. Kirk, Forest Fl. t. 15.
Myrsine Urcillei, A. D.C.—A. Rich. Fl. Nouv. Zel. t. 38 (*Suttonia australis*) ; T. Kirk, Forest Fl. t. 16.
Myrsine chathamica, F. Muell.—Veg. Chath. Is. t. 7.
Myrsine divaricata, A. Cunn.—Hook. f. Fl. Antart. i, t. 34 (*Suttonia*) ; Mez. in Pflanzenr. heft 9, t. 56, f. A, D (*Suttonia*).
Myrsine nummularia, Hook. f.—Fl. Nov. Zel. i, t. 15 (*Suttonia*).

SAPOTACEÆ.

- Sideroxylon costatum*, F. Muell.—T. Kirk, Forest Fl. t. 133.

OLEACEÆ.

- Olea apetala*, Vahl.—T. Kirk, Forest Fl. t. 27, 28.
Olea Cunninghamii, Hook. f.—T. Kirk, Forest Fl. t. 59, 59A, 59B.
Olea lanceolata, Hook. f.—T. Kirk, Forest Fl. t. 60, 61.
Olea montana, Hook. f.—Fl. Nov. Zel. i, t. 46 ; T. Kirk, Forest Fl. t. 29, 30.

APOCYNACEÆ.

- Parsonsia heterophylla*, A. Cunn.—Paxt. Fl. Gard. i, f. 60 (excellent representation of a young plant with heterophyllous foliage flowering for the first time).
Parsonia capsularis, R. Br.—Raoul, Choix, t. 11 (*P. rosea*) ; Laing & Blackw. Pl. N.Z. t. 113.

LOGANIACEÆ.

- Mitrasacme montana*, Hook. f. var. *Helmsii*, T. Kirk—Trans. N.Z. Inst. xxii (1890), t. 32.
Gentostoma lignistrifolium, A. Cunn.—Ic. Plant. t. 430 ; Solereder in Engl. Pflanzenf. iv, abt. 2, t. 16, f. A ; Laing & Blackw. t. 111.

GENTIANACEÆ.

- Gentiana lineata*, T. Kirk—Trans. N.Z. Inst. xxvii (1895), t. 27.
Gentiana Grisebachii, Hook. f.—Ic. Plant. t. 636.
Gentiana patula, Cheesem.—Laing & Blackw. Pl. N.Z. t. 112 (*G. corymbifera*) ; Hetley, Nat. Fl. N.Z. t. 24 (?).
Gentiana bellidifolia, Hook. f.—Ic. Plant. t. 635 ; Cockayne, Rept. Tong. Nat. Park, t. 4 and 25 ; Cockayne, N.Z. Pl. t. 68.
Gentiana Spenceri, T. Kirk—Trans. N.Z. Inst. xxvii (1895), t. 27, f. A, B.
Gentiana saxosa, Forst.—Act. Holm (1777), t. 5 ; T. Kirk, Trans. N.Z. Inst. xxvii (1895), t. 27c.
Gentiana cerina, Hook. f.—Fl. Antart. i, t. 36 ; Homb. & Jacq. Bot. Voy. Astrol. et Zél. t. 31c (*G. Campbelli*).
Gentiana concinna, Hook. f.—Fl. Antart. i, t. 35.
Liparophyllum Gunnii, Hook. f.—Fl. Tasm. i, t. 87.

BORAGINACEÆ.

- Myosotis pulvinaris*, Hook. f.—Buch. Trans. N.Z. Inst. xiv (1882), t. 33, f. 2, and t. 33, f. 3 (*M. Hectori*).
Myosotis antarctica, Hook. f.—Fl. Antart. i, t. 38.
Myosotis capitata, Hook. f.—Fl. Antart. t. 37.
Myosotis macrantha, Hook. f.—Bot. Mag. t. 7291 (*Ezarrhena*).
Myosotidium nobile, Hook.—Bot. Mag. t. 5137 ; Buch. Trans. N.Z. Inst. vii (1875), t. 12 ; Gurke in Engl. Pflanzenf. iv, abt. 3A, t. 42 ; Gard. Chron. 1886, i, f. 151, and 1908, ii, f. 5, 6 ; Cockayne, Trans. N.Z. Inst. xxxiv (1902), t. 17 ; N.Z. Pl. t. 1.
Tetrachondra Hamiltoni, Petrie—Ic. Plant. t. 2250 ; Petrie, Trans. N.Z. Inst. xxv (1893), t. 30, f. 8-11.

CONVOLVULACEÆ.

- Calystegia tuguriorum*, R. Br.—Hook. f. Fl. Nov. Zel. i, t. 47.
Calystegia soldanella, R. Br.—Cockayne, N.Z. Pl. t. 27.
Calystegia marginata, R. Br.—Hook. f. Fl. Nov. Zel. i, t. 48.
Convolvulus erubescens, Sims—Bot. Mag. t. 1067; Cockayne, Trans. N.Z. Inst. xxxii (1900), t. 8, f. 4-5 (seedling).
Dichondra repens, Forst.—Char. Gen. t. 20.

SOLANACEÆ.

- Solanum aviculare*, Forst.—Laing & Blackw. Pl. N.Z. t. 121.

SCROPHULARIACEÆ.

- Calceolaria Sinclairii*, Hook.—Ic. Plant. t. 561; Bot. Mag. t. 6597; Hetley, Nat. Fl. N.Z. t. 27; Kranzlin in Pflanzenr. heft 28, t. 3, f. G-V (*Jovellana*).
Calceolaria repens, Hook. f.—Kranzlin in Pflanzenr. heft 28, t. 2, f. D-G (*Jovellana*).
Mimulus repens, R. Br.—Bot. Mag. t. 5423.
Mazus pumilio, R. Br.—Ic. Plant. t. 567.
Mazus radicans, Cheesem.—Gard. Chron. 1883, ii, t. 6 (*Mimulus*); Buch. Trans. N.Z. Inst. xix (1887), t. 14 (*Ourisia montana*).
Veronica speciosa, R. Cunn.—Bot. Mag. t. 4057; Laing & Blackw. Pl. N.Z. t. 122.
Veronica Andersoni, Lindl. & Paxt.—Paxt. Fl. Gard. ii, t. 54 (hybrid between *V. elliptica* and *V. salicifolia*).
Veronica Dieffenbachii, Benth.—Bot. Mag. t. 7656; Gard. Chron. 1898, ii, t. 41.
Veronica macronura, Hook. f.—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 33, f. 36-42 (seedling).
Veronica macronura, var. *Cookiana*, Cheesem.—Gard. Chron. 1899, ii, t. 100 (good).
Veronica salicifolia, Forst.—Laing & Blackw. Pl. N.Z. t. 125; Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 30, f. 3, 3A, 3B (seedling).
Veronica anabilis, Cheesem.—T. Kirk, Forest Fl. t. 120 (*V. salicifolia*, var. *gracilis*).
Veronica chathamica, Buch.—Trans. N.Z. Inst. vii (1875), t. 13, f. 1; Gard. Chron. 1899, ii, t. 117.
Veronica angustifolia, A. Rich.—Bot. Mag. t. 5965 (*V. parviflora*, var. *angustifolia*; Cockayne, Trans. N.Z. Inst. xxxiii (1901), t. 11, f. 36-37, seedling (*V. squalida*).
Veronica diosmefolia, R. Cunn.—Bot. Mag. t. 7539 (*V. diosmefolia*, var. *triseptala*); Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 32, f. 26.
Veronica elliptica, Forst.—Bot. Mag. t. 242 (*V. decussata*); Homb. & Jacq. Bot. Voy. Astrol. et Zél. t. 9, f. V (*V. decussata*); Paxt. Fl. Gard. iii, t. 261 (*V. decussata*).
Veronica Balfouriana, Hook. f.—Bot. Mag. t. 7556.
Veronica Traversii, Hook. f.—Bot. Mag. t. 6390, 7296; Laing & Blackw. Pl. N.Z. t. 126; Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 32, f. 27, 28, and t. 34, f. 62, 66.
Veronica odora, Hook. f.—Fl. Antarct. i, t. 41.
Veronica obovata, T. Kirk—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 32, f. 23 (seedling).
Veronica monticola, Armstr.—Laing & Blackw. Pl. N.Z. t. 127.
Veronica buxifolia, Benth. var. *patens*, Cheesem.—Cockayne, Trans. N.Z. Inst. xxxiii (1901), t. 10, f. 21, 22, 23, and t. 11, f. 24, 25, 26 (*V. odora*).
Veronica anomala, Armstr.—Bot. Mag. t. 7360.
Veronica amplexicaulis, Armstr.—Bot. Mag. t. 7370.
Veronica pinguiifolia, Hook. f.—Bot. Mag. t. 6147, and t. 6587 (*V. carnosula*); Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 34, f. 61, 63, 64 (seedling).
Veronica Gilliesiana, T. Kirk—Buch. Trans. N.Z. Inst. xiv (1882), t. 29, f. 1 (*Mitrasacme Hookeri*).
Veronica tetrasticha, Hook. f.—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 34, f. 55-58 (seedling).
Veronica quadrifaria, T. Kirk—Buch. Trans. N.Z. Inst. xiv (1882), t. 29, f. 2 (*Mitrasacme Cheesemanii*).
Veronica tetragona, Hook.—Ic. Plant. t. 580, 548; Cockayne, Rept. Tong. Nat. Park, t. 18.
Veronica lycopodioides, Hook. f.—Bot. Mag. t. 7338; Laing & Blackw. Pl. N.Z. t. 128; Cockayne, Trans. N.Z. Inst. xxxvi (1904), t. 22; N.Z. Pl. t. 24.
Veronica Hectori, Hook. f.—Bot. Mag. t. 7415.
Veronica salicornioides, Hook. f.—N. E. Brown in Gard. Chron. 1888, i, t. 3.
Veronica Armstrongii, T. Kirk—Gard. Chron. 1899, ii, t. 50; Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 28, 29, and xxxiii (1901), t. 11, f. 31-35.
Veronica propinqua, Cheesem.—N. E. Brown in Gard. Chron. 1881, i, t. 5 (*Veronica cupressoides*, var. *variabilis*).
Veronica cupressoides, Hook. f.—Bot. Mag. t. 7348; N. E. Brown in Gard. Chron. 1888, i, t. 4, 6.
Veronica epacridea, Hook. f.—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 34, f. 59, 60, 65 (seedling).
Veronica Petriei, T. Kirk—Buch. Trans. N.Z. Inst. xiv (1882), t. 30, f. 1 (*Mitrasacme Petriei*).
Veronica dasyphylla, T. Kirk—Buch. Trans. N.Z. Inst. xiv (1882), t. 28, f. 2 (*Logania tetragona*).
Veronica uniflora, T. Kirk—Buch. Trans. N.Z. Inst. xiv (1882), t. 28, f. 3 (*Logania Armstrongii*).
Veronica Benthani, Hook. f.—Fl. Antarct. i, t. 39, 40; Homb. & Jacq. Bot. Voy. Astrol. et Zél. t. 9, f. Y (*V. finaustrina*).

- Veronica Hulkeana*, F. Muell.—Bot. Mag. t. 5484; Gard. Chron. 1905, ii, t. 91.
Veronica Hulkeana, F. Muell. var. *Fairfieldii*, T. Kirk—Bot. Mag. t. 7323 (*V. Fairfieldii*).
Veronica Larcandiana, Raoul—Choix, t. 10; Bot. Mag. t. 7240; Gard. Chron. 1891, i, t. 154.
Veronica pulcinaris, Hook. f. & Benth.—Bach. Trans. N.Z. Inst. xiv (1882), t. 32, f. 2 (*P. pygmaea*).
Veronica Thomsenii, Cheesem.—Bach. Trans. N.Z. Inst. xiv (1882), t. 32, f. 3.
Veronica ciliolata, Hook. f. & Benth.—Ic. Plant. t. 1047; Bach. Trans. N.Z. Inst. xiv (1882), t. 32, f. 1.
Veronica loganioides, Armistr.—Bot. Mag. t. 7104.
Veronica linifolia, Hook. f.—Cockayne, Trans. N.Z. Inst. xxxi (1899), t. 34, f. 52, 53 (seedling); Laing & Blackw. Pl. N.Z. t. 129.
Veronica catarracta, Forst. var. *diffusa*, Hook. f.—Ic. Plant. t. 645 (*V. diffusa*).
Veronica Lyallii, Hook. f.—Bot. Mag. t. 6456.
Veronica Bidwillii, Hook.—Ic. Plant. t. 814.
Veronica Hookeriana, Walp.—Ic. Plant. t. 640 (*V. nivea*).
Veronica spatulata, Benth.—Cockayne, Rept. Tong. Nat. Park, t. 5; N.Z. Pl. t. 49.
Veronica Muelleri, Buch.—Trans. N.Z. Inst. xiv (1882), t. 32.
Veronica Cheesemanii, Benth.—Ic. Plant. t. 1366A.
Veronica canescens, T. Kirk—Trans. N.Z. Inst. ix (1877), t. 19.
Ourisia macrophylla, Hook.—Ic. Plant. 545, 546; Bot. Mag. t. 8295; Laing & Blackw. Pl. N.Z. t. 130.
Euphrasia cuneata, Forst.—Wettst. Monog. Euphr. t. 5, f. 369-374, and t. 14, f. 1.
Euphrasia Mouroi, Hook. f.—Hetley, Nat. Fl. N.Z. t. 27 (?); Wettst. Monog. Euphr. t. 5, f. 376-382, and t. 14, f. 2.
Euphrasia Cockayneana, Petrie—Wettst. Monog. Euphr. p. 266, fig. 4, 5 (*E. Berggrenii*).
Euphrasia zealandica, Wettst.—Monog. Euphr. t. 6, f. 430-435, and t. 14, f. 10.
Euphrasia Cheesemanii, Wettst.—Osterr. Bot. Zeit. (1900), p. 381, f. 1-5.
Euphrasia Dyeri, Wettst.—Monog. Euphr. p. 267, fig. 6, 7.
Anagoserpa dispermu, Wettst.—Ic. Plant. t. 1283 (*Euphrasia*); T. Kirk, Trans. N.Z. Inst. xii (1880), t. 14 (*Euphrasia*).

GENNERACEÆ.

- Rhabdothamnus Solandri*, A. Cunn.—C. B. Clarke in D.C. Monog. Phan. v, t. 17; Gard. Chron. 1905, i, t. 59; Laing & Blackw. Pl. N.Z. t. 131.

MYOPORACEÆ.

- Myoporum laetum*, Forst.—T. Kirk, Forest Fl. t. 124; Alexander, Trans. N.Z. Inst. xix (1887), t. 20 (oil-glands); Laing & Blackw. Pl. N.Z. t. 119, 120.

VERBENACEÆ.

- Vitex lucens*, T. Kirk—Ic. Plant. t. 419, 420 (*V. littoralis*); T. Kirk, Forest Fl. t. 105 (*V. littoralis*); Laing & Blackw. Pl. N.Z. t. 114.
Teucriidium parvifolium, Hook. f.—Fl. Nov. Zel. i, t. 49.
Avicennia officialis, Linn.—T. Kirk, Forest Fl. t. 130; Laing & Blackw. Pl. N.Z. t. 115, 116, 117, 118.

PLANTAGINACEÆ.

- Plantago aucklandica*, Hook. f.—Fl. Antaret. i, t. 42.
Plantago Brownii, Rapin.—Hook. f. Fl. Antaret. i, t. 43 (*P. carnosa*).
Plantago triandra, Berggr.—Minnesk. Fisiog. Sällsk. Lund. (1877) t. 4, f. 12-33.

NYCTAGINACEÆ.

- Pisonia Brunonian*, Endl.—Hook. f. Fl. Nov. Zel. i, t. 50 (*P. Sinclairii*); T. Kirk, Forest Fl. t. 140.

ILLECEBRACEÆ.

- Scleranthus biflorus*, Hook. f.—Forst. Char. Gen. t. 1 (*Mniarum*); Gaertn. Fruct. ii, t. 126 (*Ditoca muscosa*).

CHENOPODIACEÆ.

- Atriplex Buchananii*, T. Kirk—Trans. N.Z. Inst. xxii (1890), t. 32, f. 1 (*Chenopodium*).
Atriplex Billardieri, Hook. f.—Fl. Tasm. i, t. 95.
Salicornia australis, Sol.—Cockayne, N.Z. Pl. t. 26.

POLYGONACEÆ.

- Rumex neglectus*, T. Kirk.—*Id.* Plant. t. 1245.
Muhlenbeckia complexa, Meissn.—Laing & Blackw. Pl. N.Z. t. 43.

PIPERACEÆ.

- Piper excelsum*, Forst.—Laing & Blackw. Pl. N.Z. t. 36 (*Macropiper*).

CHLORANTHACEÆ.

- Ascarina lucida*, Hook. f.—T. Kirk, Forest Fl. t. 129.

MONIMIACEÆ.

- Hedycarya arborea*, Forst.—*Char.* Gen. t. 64; A. Rich. Fl. Nouv. Zel. t. 33 (*Zanthoxylum novæ-zelandiæ*); Raoul, Choix, t. 30 (*H. dentata*); T. Kirk, Forest Fl. t. 110 (*H. dentata*); Laing & Blackw. Pl. N.Z. t. 50; Perkins & Gilg. in Pflanzenz. heft 4, t. 3, f. D-H.
Laurelia novæ-zelandiæ, A. Cunn.—Hook. f. Fl. Nov. Zel. i, t. 51; T. Kirk, Forest Fl. t. 71; Perkins & Gilg. in Pflanzenz. heft 4, t. 21, f. L, M.

LAURACEÆ.

- Beilschmiedia Tarairi*, Benth. & Hook. f.—T. Kirk, Forest Fl. t. 43; Laing & Blackw. Pl. N.Z. t. 51.
Beilschmiedia Tawa, Benth. & Hook. f.—T. Kirk, Forest Fl. t. 126.
Litsæa calicaris, Benth. & Hook. f.—T. Kirk, Forest Fl. t. 10.

PROTEACEÆ.

- Persoonia Toru*, A. Cunn.—T. Kirk, Forest Fl. t. 74.
Nightia excelsa, R. Br.—*Trans. Linn. Soc.* x (1810), t. 2; T. Kirk, Forest Fl. t. 35; Engl. in Pflanzenf. iii, abt. i, t. 102; Laing & Blackw. Pl. N.Z. t. 41.

THYMELÆACEÆ.

- Pimelea longijolia*, Banks & Sol.—Hetley, Nat. Fl. N.Z. t. 7.
Pimilea Gnidia, Willd.—Forst. *Char.* Gen. t. 4, f. A-I (*Banksia*).
Pimelea virgata, Vahl.—Laing & Blackw. Pl. N.Z. t. 84.
Pimelea arenaria, A. Cunn.—*Bot. Mag.* t. 3270.
Pimelea larvigata, Gaertn.—*Fruct.* i, t. 39, f. 1; Hetley, Nat. Fl. N.Z. t. 22 (*P. prostrata*).
Drapetes Dieffenbachii, Hook.—*Lond. Journ. Bot.* ii (1843), t. 17; Gilg. in Engl. Pflanzenf. iii, abt. 6A, t. 85, A, B.
Drapetes villosa, Cheesem.—Berggr. in Minnesk. Fisiog. Sallsk. Lund. (1877) t. 5, f. 1-15 (*Kelleria*).

LORANTHACEÆ.

- Elytranthe Colensoi*, Engl.—*Id.* Plant. t. 633 (*Loranthus*); Hetley, Nat. Fl. N.Z. t. 30.
Elytranthe Adamsii, Engl.—Hetley, Nat. Fl. N.Z. t. 12 (*Loranthus*).
Elytranthe flavida, Engl.—Hook. f. Fl. Nov. Zel. i, t. 27 (*Loranthus*).
Tupeia antarctica, Cham. & Schl.; Hook. f. Fl. Nov. Zel. i, t. 26; Engl. Pflanzenf. iii, abt. i, t. 130.
Korthalsella salicornioides, Van. Tiegh.—Engl. Pflanzenf. iii, abt. 1, t. 133, f. F, G (*Viscum*).
Korthalsella Lindsayi, Engl.—Lindsay, Contr. N.Z. Bot. t. 2 (*Viscum*); Engl. in Pflanzenf. iii, abt. 1, t. 133, f. D, E (*Viscum*).
Korthalsella clavatum, Cheesem.—*Trans. N.Z. Inst.* xxiv (1892), t. 37 (*Viscum*).

SANTALACEÆ.

- Fusanus Cunninghamii*, Benth. & Hook. f.—*Id.* Plant. t. 563 (*Santalum Mida*, var. β), and t. 575 (*Santalum Mida*); T. Kirk, Forest Fl. t. 75-76; Laing & Blackw. Pl. N.Z. t. 110 (*Olea Cunninghamii*).
Ezocarpus Bidwillii, Hook. f.—Fl. Nov. Zel. i, t. 52; Hierony. in Engl. Pflanzenf. iii, abt. 1, t. 138, f. A-C.

BALANOPHORACEÆ.

- Dactylanthus Taylora*, Hook. f.—*Trans. Linn. Soc.* xxii (1859), t. 75; Hill, *Trans. N.Z. Inst.* xli (1909), t. 30-32; Laing & Blackw. Pl. N.Z. t. 42.

EUPHORBIACEÆ.

- Poranthera microphylla*, Brong.—Dup. Voy. Coq. Bot. t. 50B.
Poranthera alpina, Cheesem.—Ic. Plant. t. 1366B.
Aleurites moluccana, Willd.—Forst. Char. Gen. t. 56 (*A. triloba*): Pax. in Engl. Pflanzenf. iii, abt. 5, t. 44, A-F.

URTICACEÆ.

- Paratrophis heterophylla*, Bl.—Raoul, Choix, t. 9 (*Epicarpurus microphyllus*): T. Kirk, Trans. N.Z. Inst. xxix (1897), t. 45.
Paratrophis Banksii, Cheesem.—T. Kirk, Trans. N.Z. Inst. xxix (1897), t. 46 (*P. heterophylla*, var. *elliptica*).

CUPULIFERÆ.

- Fagus Menziesii*, Hook. f.—Ic. Plant. t. 652; T. Kirk, Forest Fl. t. 89; Laing & Blackw. Pl. N.Z. t. 38; Cockayne, Rept. Tong. Nat. Park, t. 14 (*Nothofagus*).
Fagus fusca, Hook. f.—Ic. Plant. t. 631; T. Kirk, Forest Fl. t. 90; Cockayne, Rept. Tong. Nat. Park, t. 12, 13 (*Nothofagus*).
Fagus fusca, Hook. f. var. *Colensoi*, Hook. f.—Ic. Plant. t. 630; T. Kirk, Forest Fl. t. 90, f. 2.
Fagus apiculata, Col.—T. Kirk, Forest Fl. t. 135.
Fagus apiculata, var. *dubia*, Cheesem.—T. Kirk, Forest Fl. t. 91.
Fagus Blairii, T. Kirk—Trans. N.Z. Inst. xvii (1885), t. 16; T. Kirk, Forest Fl. t. 57.
Fagus Solandri, Hook. f.—Ic. Plant. t. 639; T. Kirk, Forest Fl. t. 56.
Fagus cliffortioides, Hook. f.—Ic. Plant. t. 673, 816B; T. Kirk, Forest Fl. t. 101, 101A.

CONIFERÆ.

- Agathis australis*, Salisb.—Lamb. Pinet. edit. 2, t. 44, and edit. 3, t. 55 (*Dammara*); Loudon. Arbor. Brit. iv, f. 2310-2311 (*Dammara*); Zucc. in Abhandl. Berlin Akad. iii, t. 1, f. 21, and t. 2, f. 16, 17 (*Dammara*); Naud. in Fl. des Serres. xi, p. 75 (*Dammara*); Gard. Chron. 1883, ii, t. 86 (*Dammara*); T. Kirk, Forest Fl. t. 79, 80, 80A, 81; Laing & Blackw. Pl. N.Z. t. 5, 6, 7; Cockayne, Rept. Waipoua Forest, numerous plates; Cockayne, N.Z. Pl. t. 14, 15, 16.
Libocedrus Doniana, Endl.—Hook. Lond. Journ. Bot. i (1842), t. 17 (*Thuja*); Carr. Rev. Hort. (1866) p. 230; T. Kirk, Forest Fl. t. 82, 82A; Eichler in Engl. Pflanzenf. ii, abt. 1, t. 54, D, E.
Libocedrus Bidwellii, Hook. f.—T. Kirk, Forest Fl. t. 83, 82B.
Podocarpus Totara, D. Don.—Hook. Lond. Journ. Bot. i (1842), t. 19; T. Kirk, Forest Fl. t. 115; Eichler in Engl. Pflanzenf. ii, abt. 1, t. 63.
Podocarpus Hallii, T. Kirk—Forest Fl. t. 9, 9A.
Podocarpus acutifolius, T. Kirk—Trans. N.Z. Inst. xvi (1884), t. 26; T. Kirk, Forest Fl. t. 39.
Podocarpus nivalis, Hook.—Ic. Plant. t. 582; T. Kirk, Forest Fl. t. 40.
Podocarpus ferrugineus, D. Don.—Ic. Plant. t. 542; T. Kirk, Forest Fl. t. 81; Pilger in Pflanzenr. heft 18, t. 12; Laing & Blackw. Pl. N.Z. t. 8.
Podocarpus spicatus, R. Br.—Lamb. Pinet. edit. 2, t. 7, f. 2 (*Dacrydium taxifolium*); Ic. Plant. t. 543; T. Kirk, Forest Fl. t. 4, 5; Eichler in Engl. Pflanzenf. ii, abt. 1, t. 64; Pilger in Pflanzenr. heft 18, t. 11.
Podocarpus dacrydioides, A. Rich.—Fl. Nouv. Zel. t. 39; T. Kirk, Forest Fl. t. 31, 32; Eichler in Engl. Pflanzenf. ii, abt. 1, t. 65; Pilger in Pflanzenr. heft 18, t. 7, f. A-D.
Dacrydium Kirkii, F. Muell.—Ic. Plant. t. 1219; T. Kirk, Trans. N.Z. Inst. x (1878), t. 19; Forest Fl. t. 97.
Dacrydium bifforme, Pilger—Ic. Plant. t. 544 (*Podocarpus*); T. Kirk, Forest Fl. t. 96 (*D. Colensoi*).
Dacrydium Bidwellii, Hook. f.—T. Kirk, Forest Fl. t. 37; Pilger in Pflanzenr. heft 18, t. 4, f. A-C.
Dacrydium cupressinum, Soland.—Lamb. Pinet. edit. 2, t. 41; A. Rich. Con. t. 2; T. Kirk, Forest Fl. t. 18-22; Eichler in Engl. Pflanzenf. ii, abt. 1, t. 66; Pilger in Pflanzenr. t. 6; Laing & Blackw. Pl. N.Z. t. 12.
Dacrydium intermedium, T. Kirk—Trans. N.Z. Inst. x (1878), t. 20; Forest Fl. t. 86; Pilger in Pflanzenr. t. 5, f. C-D.
Dacrydium Colensoi, Hook.—Ic. Plant. t. 548; T. Kirk, Trans. N.Z. Inst. x (1878), t. 18 (*D. Westlandicum*); Ic. Plant. t. 1218 (*D. Westlandicum*); T. Kirk, Forest Fl. t. 85 (*D. Westlandicum*).
Dacrydium laizifolium, Hook. f.—Ic. Plant. t. 815; T. Kirk, Forest Fl. t. 87; Pilger in Pflanzenr. heft 18, t. 5, f. B; Cockayne, Rept. Tong. Nat. Park, t. 18; N.Z. Pl. t. 52.
Phyllocladus trichomanoides, D. Don.—Ic. Plant. t. 549, 550, 551; T. Kirk, Forest Fl. t. 6, 7; Eichler in Engl. Pflanzenf. ii, abt. 1, t. 67A; Pilger in Pflanzenr. heft 18, t. 18, f. P-S.
Phyllocladus glaucus, Carr.—T. Kirk, Forest Fl. t. 98, 99; Pilger in Pflanzenr. heft 18, t. 18, f. A-E.
Phyllocladus alpinus, Hook. f.—Fl. Nov. Zel. i, t. 53; T. Kirk, Forest Fl. t. 100; Pilger in Pflanzenr. heft 18, t. 18, f. F-H.

ORCHIDACEÆ.

- Dendrobium Cunninghamii*, Lindl.—A. Rich. Fl. Nouv. Zel. t. 26 (*D. biflorum*); Hetley, Nat. Fl. N.Z. t. 17; Kranzlin in Pflanzentr. heft 45, t. 8, f. F-N; Laing & Blackw. Pl. N.Z. t. 34.
- Earina mucronata*, Lindl.—Ic. Plant. t. 431; Hetley, Nat. Fl. N.Z. t. 28.
- Earina suaveolens*, Lindl.—Laing & Blackw. Pl. N.Z. t. 31, 33.
- Spiranthes australis*, Lindl.—Bot. Reg. t. 823; Fitzgerald, Austral. Orchids, i, pt. 2.
- Thelymitra izioides*, Swz.—Vet. Akad. Handl. Stockh. (1800) t. 3; Hook. f. Fl. Tasm. ii, t. 103B; Fitzgerald, Austral. Orchids, i, pt. 3.
- Thelymitra longifolia*, Forst.—Char. Gen. t. 49; A. Rich. Fl. Nouv. Zel. t. 25, f. 2 (*T. Forsteri*); Fitzgerald, Austral. Orchids, i, pt. 6; Laing & Blackw. Pl. N.Z. t. 30.
- Thelymitra intermedia*, Berggr.—Minnesk. Fisiog. Sällsk. Lund. (1877) t. 5, f. 21-24.
- Orthoceras strictum*, R. Br.—A. Rich. Fl. Nouv. Zel. t. 25, f. 1 (*Diuris novæ-zelandiæ*); Fitzgerald, Austral. Orchids, i, pt. 3.
- Microtis porrifolia*, R. Br.—Fitzgerald, Austral. Orchids, ii, pt. 1; Laing & Blackw. Pl. N.Z. t. 30.
- Prasophyllum patens*, R. Br.—Hook. f. Fl. Tasm. ii, t. 111; Buch. Trans. N.Z. Inst. xix (1887), t. 15 (*Gastrodia Hectori*).
- Prasophyllum rufum*, R. Br.—Fitzgerald, Austral. Orchids, ii, pt. 4.
- Caleana minor*, R. Br.—Fitzgerald, Austral. Orchids, i, pt. 6.
- Pterostylis Banksii*, R. Br.—Bot. Mag. t. 3172; Laing & Blackw. Pl. N.Z. t. 32.
- Pterostylis trullifolia*, Hook. f.—Cheesem. Trans. N.Z. Inst. v, t. 20.
- Pterostylis barbata*, Lindl.—Hook. f. Fl. Tasm. ii, t. 116.
- Pterostylis mutica*, R. Br.—Hook. f. Fl. Tasm. ii, t. 117A; Fitzgerald, Austral. Orchids, i, pt. 2.
- Calochilus campestris*, R. Br.—Fitzgerald, Austral. Orchids, i, pt. 4.
- Calochilus paludosus*, R. Br.—Fitzgerald, Austral. Orchids, i, pt. 4.
- Caladenia minor*, Hook. f.—Fl. Nov. Zel. i, t. 56B.
- Chiloglottis formicifera*, Fitzgerald—Austral. Orchids, i, pt. 3.
- Adenochilus gracilis*, Hook. f.—Fl. Nov. Zel. i, 56A.
- Corysanthes Cheesemanii*, Hook. f.—Ic. Plant. t. 1120.
- Corysanthes oblonga*, Hook. f.—Fl. Nov. Zel. i, t. 57B (*Nematoceras*).
- Corysanthes macrantha*, Hook. f.—Fl. Nov. Zel. i, t. 57A (*Nematoceras*); Laing & Blackw. Pl. N.Z. t. 35.
- Gastrodia sesamoides*, R. Br.—Hook. f. Fl. Tasm. ii, t. 126; Fitzgerald, Austral. Orchids, ii, pt. 5.
- Gastrodia Cunninghamii*, Hook. f.—Petrie in Trans. N.Z. Inst. xxv (1893), t. 20, f. 1-4.
- Gastrodia minor*, Petrie—Trans. N.Z. Inst. xxv (1893), t. 20, f. 5-7.

IRIDACEÆ.

- Libertia izioides*, Spreng.—Hetley, Nat. Fl. N.Z. t. 23.
- Libertia grandiflora*, Sweet.—Gard. Chron. 1908, i, f. 1.

AMARYLLIDACEÆ.

- Hypoxis pusilla*, Hook. f.—Fl. Tasm. i, t. 130B.

LILIACEÆ.

- Rhipogonum scandens*, Forst.—Char. Gen. t. 25; Ic. Plant. t. 1395; Laing & Blackw. Pl. N.Z. t. 20; Cockayne, N.Z. Pl. t. 11.
- Luzuriaga marginata*, Lam.—Gaertn. Fruct. i, t. 59 (*Enargea*); Ic. Plant. t. 632 (*Callixene parviflora*); Laing & Blackw. Pl. N.Z. t. 22.
- Cordyline terminalis*, Kunth.—Jacq. Ic. Rar. t. 448 (*Dracæna*); Bot. Reg. t. 1749 (*Dracæna*); Bot. Mag. t. 2053 (*Dracæna ferrea*).
- Cordyline Banksii*, Hook. f.—Regel in Gartenfl. t. 344; Gard. Chron. 1895, ii, t. 103. and 1906, ii t. 100.
- Cordyline australis*, Hook. f.—Bot. Mag. t. 5636; Ill. Hortie. xvii (1870), t. 35 (*C. lentiginosa*); T. Kirk. Forest Fl. t. 141; Gard. Chron. 1882, ii, t. 49. and 1898, i, t. 61; Laing & Blackw. Pl. N.Z. t. 21, 23; Cockayne, Trans. N.Z. Inst. xli (1909), t. 29 (adventitious roots).
- Cordyline indivisa*, Steud.—Cockayne. Rept. Tong. Nat. Park, t. 16; Cockayne, N.Z. Pl. t. 61.
- Cordyline pumilio*, Hook. f.—Fl. Nov. Zel. i, t. 58 (*C. stricta*).
- Astelia Cunninghamii*, Hook. f.—A. Rich. Fl. Nouv. Zel. t. 24, excl. fig. C. D. (*Hamelinia veratroides*); Bot. Mag. t. 5175; Laing & Blackw. Pl. N.Z. t. 24.
- Astelia Banksii*, A. Cunn.—Laing & Blackw. Pl. N.Z. t. 26.
- Astelia trinervia*, T. Kirk—Cockayne, Rept. Waipoua Forest, t. 8, 9.
- Astelia Solandri*, A. Cunn.—Bot. Mag. t. 5503; Cockayne, Rept. Waipoua Forest, t. 5, 6; N.Z. Pl. t. 9.
- Astelia nervosa*, Banks & Sol.—Laing & Blackw. Pl. N.Z. t. 25.
- Phormium tenax*, Forst.—Char. Gen. t. 24; Redoute Lil. t. 448-449; Bot. Mag. t. 3199; Hutton Trans. N.Z. Inst. ii, t. 7 (structure of leaf); Laing & Blackw. Pl. N.Z. t. 28.
- Phormium Cookianum*, Le Jolis—Bot. Mag. t. 6973 (*P. Hookeri*).

- Bulbinella Rossii*, Benth. & Hook. f.—Hook. f. Fl. Antarct. i, t. 44, 45 (*Chrysobactron*); Homb. & Jacq. Bot. Voy. Astrol. et Zél. t. 46 (*Veratrum Dobouzei*).
Bulbinella Hookeri, Benth. & Hook. f.—Ic. Plant. t. 817 (*Chrysobactron*); Bot. Mag. t. 1602 (*Chrysobactron*); Hetley, Nat. Fl. N.Z. t. 14 (*Anthericum*).
Arthropodium cirratum, R. Br.—Bot. Mag. t. 2350; Bot. Reg. t. 709; Gard. Chron. 1874, i, t. 137.
Arthropodium candidum, Raoul—Choix, t. 6.
Herpolarion nova-zelandiar, Hook. f.—Fl. Tasm. ii, t. 432b (*H. tasmaniar*); Laing & Blackw. Pl. N.Z. t. 29.

JUNCACEÆ.

- Rostkovia magellanica*, Hook. f.—Desv. Journ. Bot. i (1808), t. 12, f. 2 (*R. sphaerocarpa*); Buchen. Monog. Juncac. t. 7, and t. 2, f. 4; Buchen. in Pflanzenr. heft 25, t. 34.
Rostkovia gracilis, Hook. f.—Fl. Antarct. i, t. 47; Buch. Trans. N.Z. Inst. iv (1871), t. 46 (*R. nova-zelandiar*); Buchen. in Pflanzenr. heft 25, t. 33 (*Marsippospermum*).
Juncus pallidus, R. Br.—Buchen. in Pflanzenr. heft 25, t. 72.
Juncus vaginatus, R. Br.—Hook. f. Fl. Tasm. ii, t. 131 (*J. australis*).
Juncus planifolius, R. Br.—Buchen. in Pflanzenr. heft 25, t. 147.
Juncus antarcticus, Hook. f.—Fl. Antarct. i, t. 16.
Juncus prismatocarpus, R. Br.—Buchen. in Pflanzenr. heft 25, t. 89.
Juncus scheuchzerioides, Gaud.—Buchen. in Pflanzenr. heft 25, t. 86.
Luzula micrantha, Buchen. var. *crenulata*, Cheesem.—Buchen. in Pflanzenr. heft 25, t. 56 (*L. crenulata*).
Luzula Cheesemanii, Buchen.—Pflanzenr. heft 25, t. 57.
Luzula campestris, D.C. var. *pieta*, Hook. f.—Buchen. in Pflanzenr. heft 25, t. 52.
Luzula campestris, var. *Banksiana*, Buchen.—Pflanzenr. heft 25, t. 53.
Luzula campestris, var. *crinita*, Buchen.—Hook. f. Fl. Antarct. i, t. 48 (*L. crinita*).

PALMACEÆ.

- Rhopalostylis sapida*, Wendl. & Drude.—Bot. Mag. t. 5139 (*Areca*); Hook. f. Fl. Nov. Zél. i, t. 59, 60 (*Areca*); Hetley, Nat. Fl. N.Z. t. 8 (*Areca*); Percy Smith, Trans. N.Z. Inst. x (1878), t. 15 (branched specimen); Laing & Blackw. Pl. N.Z. t. 15-19; Cheesem. Trans. N.Z. Inst. xxxix (1907), t. 11, and xlii (1910), t. 26-27 (branched specimens).
Rhopalostylis Baueri, Wendl. & Drude.—Bot. Mag. t. 5735 (*Areca*).

PANDANACEÆ.

- Freycinetia Banksii*, A. Cunn.—Hook. f. Fl. Nov. Zél. i, t. 54, 55; Bot. Mag. t. 6028; Hetley, Nat. Fl. N.Z. t. 36; Laing & Blackw. Pl. N.Z. t. 13, 14.

TYPHACEÆ.

- Sparganium angustifolium*, Graebner—Pflanzenr. heft 2, t. 4, f. B.

NATADACEÆ.

- Triglochin striatum*, Ruiz & Pav. var. *filifolium*, Buchen.—Ic. Plant. t. 579 (*T. filifolium*).
Potamogeton natans, Linn.—Graebner in Pflanzenr. heft 31, t. 13.
Potamogeton polygonifolius, Pourr.—Graebner in Pflanzenr. heft 31, t. 16, f. A-D.
Potamogeton ochreatus, Raoul—Choix, t. 7.
Potamogeton pectinatus, Linn.—Graebner in Pflanzenr. heft 31, t. 28, f. A-B.
Ruppia maritima, Linn.—Graebner in Pflanzenr. heft 31, t. 30.
Zannichellia palustris, Linn.—Graebner in Pflanzenr. heft 31, t. 34.

CENTROLEPIDACEÆ.

- Centrolepis pallida*, Cheesem.—Hook. f. Fl. Nov. Zél. t. 62c (*Alepyrum pallidum*).

RESTIACEÆ.

- Leptocarpus simplex*, A. Rich.—Hook. f. Fl. Nov. Zél. i, t. 61.
Hypochaeris lateriflora, Benth.—Labill. Pl. Nov. Holl. ii, t. 228 (*Calorophus elongatus*).

CYPERACEÆ.

- Kyllinga brevifolia*, Rottb.—Descr. et Ic. t. 4, f. 3; C. B. Clarke, Ill. Cyp. t. 1, f. 1-4.
Mariscus ustulatus, C. B. Clarke—A. Rich. Fl. Nouv. Zel. t. 17 (*Cyperus*).
Eleocharis sphacelata, R. Br.—C. B. Clarke, Ill. Cyp. t. 34, f. 1-6.
Eleocharis neo-zelandica, C. B. Clarke—Ill. Cyp. t. 36, f. 10-14.
Scirpus lenticularis, Poir.—Hook. f. Fl. Tasm. ii, t. 145D (*Isolepis*).
Scirpus basilaris, C. B. Clarke—Ill. Cyp. t. 47, f. 3, 4.
Scirpus aucklandicus, Boeck.—Hook. f. Fl. Antaret. i, t. 50 (*Isolepis*).
Scirpus aucklandicus, Boeck. var. *subcucullata*, Berggr.—Minnesk. Fisiog. Sallsk. Lund. (1877) t. 5, f. 16-20 (*Isolepis subcucullata*).
Scirpus cernuus, Vahl.—Hook. f. Fl. Tasm. ii, t. 145C (*Isolepis riparia*).
Scirpus antarcticus, Linn.—Hook. f. Fl. Tasm. ii, t. 145 (*Isolepis cartilaginea*).
Scirpus inundatus, Poir.—Hook. f. Fl. Tasm. ii, t. 144 (*Isolepis prolifera*).
Scirpus prolifer, Rottb.—Descr. et Ic. t. 17, f. 2.
Scirpus nodosus, Rottb.—Descr. et Ic. t. 8, f. 3; A. Rich. Fl. Nouv. Zel. t. 18 (*Isolepis*).
Scirpus frondosus, Banks & Sol.—A. Rich. Fl. Nouv. Zel. t. 19 (*Isolepis spiralis*); C. B. Clarke, Ill. Cyp. t. 53, f. 1-3.
Carpha alpina, R. Br.—Ic. Plant. t. 1216; C. B. Clarke, Ill. Cyp. t. 76, f. 1-4.
Schænus pauciflorus, Hook. f.—C. B. Clarke, Ill. Cyp. t. 79, f. 8-9.
Schænus axillaris, Poir.—Hook. f. Fl. Nov. Zel. i, t. 62A (*Chaetospora*); C. B. Clarke, Ill. Cyp. t. 80, f. 1-2.
Schænus nitens, Poir. var. *concinus*, Cheesem.—Hook. f. Fl. Nov. Zel. i, t. 62B.
Cladium Sinclairii, Hook. f.—C. B. Clarke, Ill. Cyp. t. 84.
Cladium complanatum, Berggr.—Minnesk. Fisiog. Sallsk. Lund. (1877) t. 6, f. 1-5.
Cladium Gunnii, Hook. f.—Fl. Tasm. ii, t. 148B; Berggr. Minnesk. Fisiog. Sallsk. Lund. (1877) t. 6, f. 6-11.
Cladium Vauthiera, C. B. Clarke—A. Rich. Fl. Nouv. Zel. t. 20 (*Vauthiera australis*).
Cladium capillaceum, C. B. Clarke—Hook. f. Fl. Tasm. ii, t. 141A (*Chaetospora capillacea*).
Lepidosperma laterale, R. Br.—Hook. f. Fl. Tasm. ii, t. 146B (*L. concavum*); C. B. Clarke, Ill. Cyp. t. 86, f. 4-5.
Lepidosperma filiforme, Labill.—Pl. Nov. Holl. i, t. 15.
Gahnia setifolia, Hook. f.—C. B. Clarke, Ill. Cyp. t. 98, f. 1-7.
Gahnia pauciflora, T. Kirk—C. B. Clarke, Ill. Cyp. t. 97, f. 6.
Gahnia xanthocarpa, Hook. f.—Gard. Chron. 1873, t. 333.
Gahnia procera, Forst.—Char. Gen. t. 26.
Gahnia Gaudichaudi, Steud.—Brong. in Dup. Voy. Coq. Bot. t. 29 (*Lampocarya affinis*); Gaud. in Frey. Voy. Bot. t. 28 (*Morelotia gahniaeformis*); C. B. Clarke, Ill. Cyp. t. 96, f. 5-6.
Oreobolus pumilio, R. Br.—C. B. Clarke, Ill. Cyp. t. 102, f. 1-5.
Oreobolus pumilio, R. Br. var. *pectinatus*, C. B. Clarke—Hook. f. Fl. Antaret. i, t. 49 (*O. pectinatus*).
Oreobolus strictus, Berggr.—Minnesk. Fisiog. Sallsk. Lund. (1877) t. 6, f. 12-24.
Uncinia tenella, R. Br.—Hook. f. Fl. Tasm. ii, t. 152.
Uncinia compacta, R. Br.—Hook. f. Fl. Tasm. ii, t. 153B.
Uncinia purpurata, Petrie—Kukenth. in Pflanzenr. heft 38, t. 14C.
Uncinia australis, Pers. var. *ferruginea*, C. B. Clarke—Boott. in Hook. f. Fl. Nov. Zel. i, t. 64B (*U. ferruginea*).
Uncinia leptostachya, Raoul—Choix, t. 5B; Kukenth. in Pflanzenr. heft 38, t. 13N.
Uncinia riparia, R. Br.—Boott. in Hook. f. Fl. Tasm. ii, t. 152B.
Uncinia riparia, R. Br. var. *Hookeri*, Kukenth.—Boott. in Hook. f. Fl. Antaret. i, t. 51 (*U. Hookeri*).
Uncinia riparia, R. Br. var. *Banksii*, C. B. Clarke—Kukenth. in Pflanzenr. heft 38, t. 13. K-M.
Uncinia rubra, Boott.—Hook. f. Fl. Nov. Zel. i, t. 64A.
Uncinia rupestris, Raoul—Choix, t. 5A.
Carex pyrenaica, Wahl.—Boott. Ill. Car. iv, t. 475, 476; Kukenth. in Pflanzenr. heft 38, t. 21, L-M.
Carex acicularis, Boott.—Hook. f. Fl. Nov. Zel. i, t. 63C; Boott. Ill. Car. iv, t. 508, f. 2; Hook. f. Fl. Tasm. ii, t. 150 (*C. Archeri*); Boott. Ill. Car. iv, t. 508, f. 3 (*C. Archeri*).
Carex kaloides, Petrie—Kukenth. in Pflanzenr. heft 38, t. 23, G-H.
Carex appressa, R. Br.—Boott. Ill. Car. i, t. 119, 120; Kukenth. in Pflanzenr. heft 38, t. 29, f. E-J.
Carex virgata, Sol.—Boott. Ill. Car. i, t. 121, 122.
Carex secta, Boott.—Ill. Car. i, t. 123, 124.
Carex inversa, R. Br.—Boott. Ill. Car. iv, t. 488; Kukenth. in Pflanzenr. heft 38, t. 31, f. A-C.
Carex Colensoi, Boott.—Hook. f. Fl. Nov. Zel. i, t. 63B.
Carex stellulata, Good.—Kukenth. in Pflanzenr. heft 38, t. 37, f. C-D.
Carex lagopina, Wahl.—Kukenth. in Pflanzenr. heft 38, t. 35, f. A-B.
Carex Gaudichaudiana, Kunth.—Boott. in Hook. f. Fl. Tasm. ii, t. 151A; Boott. Ill. Car. iv, t. 567 (*C. vulgaris*, var. *Gaudichaudiana*).
Carex ternaria, Forst.—A. Rich. Fl. Nouv. Zel. t. 21 (*C. polystachya*); Boott. Ill. Car. iv, t. 596, 598; Kukenth. in Pflanzenr. heft 38, t. 59.
Carex Darwinii, Boott.—Hook. f. Fl. Antaret. ii, t. 144; Boott. Ill. Car. iv, t. 504, 505.

- Carex Raoulii*, Boott.—III. Car. iii, t. 333.
Carex dipsacea, Berggr.—Minnesk. Fisiog. Sallsk. Lund. (1877) t. 7, f. 8-11.
Carex testacea, Sol.—Kukenth. in Pflanzenr. heft 38, t. 118, f. A-E.
Carex lucida, Boott.—III. Car. i, t. 173.
Carex Buchanani, Berggr.—Minnesk. Fisiog. Sallsk. Lund. (1877) t. 7, f. 1-7 (*C. tenax*).
Carex cirrhosa, Berggr.—Minnesk. Fisiog. Sallsk. Lund. (1877) t. 7, f. 27-31; Kukenth. in Pflanzenr. heft 38, t. 117, f. A-F.
Carex Berggreni, Petrie—Kukenth. in Pflanzenr. heft 38, t. 117, f. G-K.
Carex comans, Berggr.—Minnesk. Fisiog. Sallsk. Lund. (1877) t. 7, f. 15-19.
Carex comans, Berggr. var. *pulehella*, C. B. Clarke—Berggr. in Minnesk. Fisiog. Sallsk. Lund. (1877) t. 7, f. 20-26 (*C. pulehella*).
Carex litorosa, Bailey—Kukenth. in Pflanzenr. heft 38, t. 118, f. F-G.
Carex dissita, Sol.—Boott. III. Car. i, t. 176.
Carex dissita, Sol. var. *Lambertiana*, Cheesem.—Boott. III. Car. i, t. 177 (*C. Lambertiana*).
Carex Solandri, Boott.—III. Car. i, t. 175.
Carex trifida, Cav.—Ic. v, t. 465; Boott. III. Car. iv, t. 414; Kukenth. in Pflanzenr. heft 38, t. 125, f. A-C.
Carex breviculmis, R. Br.—Boott. in Hook. f. Fl. N.Z. i, t. 63A.
Carex punula, Thunb.—Kukenth. in Pflanzenr. heft 38, t. 126.
Carex Brownii, Tucker—Boott. III. Car. iv, t. 532; Kukenth. in Pflanzenr. heft 38, t. 104, f. A-D.
Carex flava, Linn. var. *cataractae*, Kukenth.—Boott. in Hook. f. Fl. Tasm. ii, t. 151 (*C. cataractae*).
Carex Forsteri, Wahl.—A. Rich. Fl. Nouv. Zel. t. 21 (*C. punctulata*); Boott. III. Car. i, t. 137.
Carex pseudo-cyperus, Linn. var. *fascicularis*, Boott.—III. Car. t. 139, 140 (*C. fascicularis*).

GRAMINEÆ.

- Imperata arundinacea*, Cyr.—Pl. Rar. Ic. ii, t. 11.
Zoysia pungens, Willd.—Buch. N.Z. Grasses, t. 13A.
Paspalum scrobiculatum, Linn.—Buch. N.Z. Grasses, t. 10A.
Paspalum distichum, Linn.—Buch. N.Z. Grasses, t. 10B.
Isachne australis, R. Br.—Buch. N.Z. Grasses, t. 12.
Opismenus undulatifolius, Beauv.—Buch. N.Z. Grasses, t. 11 (*Panicum imbecille*).
Cenchrus caryculatus, Cav.—Ic. v, t. 463; Labill. Sert. Austr. Caled. t. 19 (*C. anomoplexis*).
Spinifex hirsutus, Labill.—Pl. Nov. Holl. ii, t. 230, 231; Buch. N.Z. Grasses, t. 8, 9.
Ehrharta Colensoi, Hook. f.—Fl. Nov. Zel. i, t. 65A; Buch. N.Z. Grasses, t. 1.
Ehrharta Thomsoni, Petrie—Trans. N.Z. Inst. xii (1880), t. 10.
Microlæna stipoides, R. Br.—Buch. N.Z. Grasses, t. 2.
Microlæna avenacea, Hook. f.—Raoul, Choix, t. 3 (*Diplaz*); Buch. N.Z. Grasses, t. 3.
Microlæna polymoda, Hook. f.—Buch. N.Z. Grasses, t. 4.
Hierochloa redolens, R. Br.—Buch. N.Z. Grasses, t. 6, and t. 35 (*Danthonia Buchanani*).
Hierochloa Fraseri, Hook. f.—Buch. N.Z. Grasses, t. 7 (*H. alpina*).
Hierochloa Brunonis, Hook. f.—Fl. Antarct. i, t. 52.
Stipa arundinacea, Benth.—Hook. f. Fl. Nov. Zel. i, t. 67 (*Apera*); Buch. N.Z. Grasses, t. 17 (*Apera*).
Stipa teretifolia, Steud.—Hook. f. Fl. N.Z. i, t. 66 (*Dichelachne stipoides*); Buch. N.Z. Grasses, t. 14 (*Dichelachne stipoides*).
Stipa setacea, R. Br.—Hook. f. Fl. Tasm. ii, t. 157B; Buch. N.Z. Grasses, t. 17, ii (*S. Petriei*).
Echinopogon ovatus, Beauv.—Agrost. t. 9; Buch. N.Z. Grasses, t. 13B.
Alopecurus geniculatus, Linn.—Buch. N.Z. Grasses, t. 5.
Sporobolus indicus, R. Br.—Buch. N.Z. Grasses, t. 18 (*S. elongatus*).
Simplicia laza, T. Kirk—Trans. N.Z. Inst. xxix (1897), t. 44.
Agrostis magellanica, Lam.—Hook. f. Fl. Antarct. ii, t. 132 (*A. antarctica*); Wild. Bot. Voy. Belgica. t. 16, f. I-Y.
Agrostis muscosa, T. Kirk—Berggr. Minnesk. Fisiog. Sallsk. Lund. (1877) t. 7, f. 41-47 (*A. armula*, var. *spathacea*); Buch. N.Z. Grasses, t. 20B (*A. canina*, var. *gelida*).
Agrostis subulata, Hook. f.—Fl. Antarct. i, t. 53.
Agrostis Dyeri, Petrie—Buch. N.Z. Grasses, t. 19 (*A. canina*), and t. 20A (*A. parviflora*).
Deyeuxia Forsteri, Kunth.—Buch. N.Z. Grasses, t. 21 (*Agrostis armula*).
Deyeuxia Forsteri, Kunth. var. *pilosa*, Cheesem.—A. Rich. Fl. Nouv. Zel. t. 23 (*Agrostis pilosa*); Buch. N.Z. Grasses, t. 22 (*Agrostis pilosa*).
Deyeuxia Billardieri, Kunth.—Buch. N.Z. Grasses, t. 23 (*Agrostis*).
Deyeuxia setifolia, Hook. f.—Fl. Nov. Zel. i, t. 65B; Buch. N.Z. Grasses, t. 24B (*Agrostis*).
Deyeuxia avenoides, Buch.—N.Z. Grasses, t. 24A (*Agrostis*).
Deyeuxia Youngii, Buch.—N.Z. Grasses, t. 25 (*Agrostis*).
Deyeuxia quadrifida, Benth.—Labill. Pl. Nov. Holl. i, t. 32 (*Avena*); Buch. N.Z. Grasses, t. 26A, and 26B (*Agrostis*).
Deyeuxia Petriei, Hackel—Buch. N.Z. Grasses, t. 26A (*D. scabra*).

- Dichelachne crinita*, Hook. f.—Buch. N.Z. Grasses, t. 15.
Dichelachne sciurea, Hook. f.—Buch. N.Z. Grasses, t. 16.
Deschampsia caespitosa, Beauv.—Agrost. t. 18, f. 3; Hook. f. Fl. Antarct. ii, t. 135 (*Aira Kingii*); Buch. N.Z. Grasses, t. 37.
Deschampsia Chapmanii, Petrie—Hook. f. Fl. Antarct. i, t. 56 (*Catabrosa antarctica*).
Deschampsia tenella, Petrie—Buch. N.Z. Grasses, t. 41B (*Catabrosa antarctica*).
Trisetum antarcticum, Trin.—Hook. f. Fl. Nov. Zel. i, t. 68B; Buch. N.Z. Grasses, t. 39.
Trisetum Youngii, Hook. f.—Buch. N.Z. Grasses, t. 40B.
Trisetum subspicatum, Beauv.—Buch. N.Z. Grasses, t. 40A.
Amphibromus fluitans, T. Kirk—Trans. N.Z. Inst. xvi (1884), t. 28.
Danthonia Cunninghamii, Hook. f.—Fl. Nov. Zel. i, t. 69A (*D. rigida*); Buch. N.Z. Grasses, t. 29.
Danthonia ovata, Buch.—N.Z. Grasses, t. 29, ii.
Danthonia bromoides, Hook. f.—Fl. Nov. Zel. i, t. 68A; Hook. f. Fl. Antarct. i, t. 54 (*Bromus antarcticus*).
Danthonia Raoulii, Steud.—Buch. N.Z. Grasses, t. 30; Phillips Turner, Rept. Waimarino District, p. 4.
Danthonia Raoulii, Steud. var. *flavescens*, Hack.—Buch. N.Z. Grasses, t. 30 (*D. flavescens*).
Danthonia australis, Buch.—N.Z. Grasses, t. 31.
Danthonia pilosa, R. Br.—Buch. N.Z. Grasses, t. 33, and 33, iia.
Danthonia pilosa, R. Br. var. *racemosa*, Buch.—N.Z. Grasses, t. 33, iib.
Danthonia semianularis, R. Br.—Hook. f. Fl. Nov. Zel. t. 69B (*D. gracilis*); Raoul, Choix, t. 3 (*D. unarede*); Buch. N.Z. Grasses, t. 34, and t. 34, iib.
Danthonia semianularis, R. Br. var. *seifolia*, Hook. f.—Buch. N.Z. Grasses, t. 34, iia (var. *alpina*).
Danthonia nuda, Hook. f.—Buch. N.Z. Grasses, t. 36A, and t. 36, ii (*D. Thomsoni*).
Eleusine indica, Gaertn.—Trin. Sp. Gram. Ic. t. 71.
Arundo conspicua, Forst.—Bot. Mag. t. 6232; Buch. N.Z. Grasses, t. 27.
Arundo fulvida, Buch.—N.Z. Grasses, t. 28.
Triodion exigua, T. Kirk.—Buch. N.Z. Grasses, t. 36B (*Danthonia pauciflora*).
Kaleria Kurtzii, Hackel.—Buch. N.Z. Grasses, t. 38 (*K. cristata*); Domin. Monog. Kœleria, t. 7, f. 9–11 (*K. novo-zelandica*), and t. 7, f. 12 (*K. Gintlii*).
Poa foliosa, Hook. f.—Fl. Antarct. i, t. 55 (*Festuca*); Buch. N.Z. Grasses, t. 42.
Poa novo-zelandica, Hackel.—Buch. N.Z. Grasses, t. 43, A, B (*P. foliosa*, var. β).
Poa Astoni, Petrie—Buch. N.Z. Grasses, t. 55A (*Festuca scoparia*).
Poa ramosissima, Hook. f.—Cockayne in Repts. Subantarct. Is. N.Z. i, p. 212, f. 9.
Poa anceps, Forst.—Buch. N.Z. Grasses, t. 44, A, B.
Poa seticulmis, Petrie.—Buch. N.Z. Grasses, t. 46E (*P. anceps*, var. *debilis*).
Poa pusilla, Berggr.—Minnesk. Fisiog. Sallsk. Lund. (1877) t. 7, f. 35–40; Buch. N.Z. Grasses, t. 46F (*P. anceps*, var. *minima*).
Poa caespitosa, Forst.—Buch. N.Z. Grasses, t. 4 (*P. australis*, var. *levis*).
Poa litorea, Cheesem.—Homb. & Jacq. Voy. au Pole Sud, t. 8A (*Festuca scoparia*); Kew Bull. 1908, p. 237; (reproduced in Cockayne, N.Z. Pl. frontispiece, and Repts. Subantarct. Is. N.Z. i, p. 187, f. 1).
Poa Colensoi, Buch.—N.Z. Grasses, t. 48B.
Poa Colensoi, var. *intermedia*, Cheesem.—Buch. N.Z. Grasses, t. 48A (*P. intermedia*).
Poa acicularifolia, Buch.—N.Z. Grasses, t. 49A.
Poa pygmaea, Buch.—N.Z. Grasses, t. 50A.
Poa Kirkii, Buch.—N.Z. Grasses, t. 51B.
Poa Kirkii, Buch. var. *Mackayi*, Hackel.—Buch. N.Z. Grasses, t. 51A (*P. Mackayi*).
Poa Lindsayi, Hook. f.—Lindsay, Contr. N.Z. Bot. t. 4; Buch. N.Z. Grasses, t. 52.
Poa exigua, Hackel.—Buch. N.Z. Grasses, t. 50B.
Poa sclerophylla, Berggr.—Buch. N.Z. Grasses, t. 50C (*P. albida*).
Poa imbecilla, Forst.—Buch. N.Z. Grasses, t. 53A (*P. breviglumis*), 53B.
Atropis stricta, Hackel.—Hook. f. Fl. Tasm. ii, t. 162B (*Glyceria*); Buch. N.Z. Grasses, t. 41A (*Glyceria*).
Festuca littoralis, Labill.—Pl. Nov. Holl. i, t. 27; Buch. N.Z. Grasses, t. 54.
Festuca rubra, Linn.—Buch. N.Z. Grasses, t. 55B (*F. duriuscula*).
Bromus arenarius, Labill.—Pl. Nov. Holl. i, t. 28; Buch. N.Z. Grasses, t. 56A.
Agropyrum multiflorum, T. Kirk.—Buch. N.Z. Grasses, t. 56B (*Triticum*).
Agropyrum scabrum, Beauv.—Labill. Pl. Nov. Holl. i, t. 26 (*Festuca*); Buch. N.Z. Grasses, t. 57 (*Triticum*).
Asperella gracilis, T. Kirk.—Hook. f. Fl. Nov. Zel. i, t. 70 (*Gymnostichum*); Buch. N.Z. Grasses, t. 58 (*Gymnostichum*).

FILICES.

- Hymenophyllum rarum*, R. Br.—Field, N.Z. Ferns, t. 5, f. 5.
Hymenophyllum polyanthos, Swartz, var. *sanguinolentum*, Hook.—Field, N.Z. Ferns, t. 28, f. 7.
Hymenophyllum villosum, Col.—Field, N.Z. Ferns, t. 19, f. 7 (*H. polyanthos*, var. *villosum*).

- Hymenophyllum australe*, Willd.—Field, N.Z. Ferns, t. 15, f. 1 (*H. javanicum*).
Hymenophyllum atrocircens, Col.—T. Kirk, Trans. N.Z. Inst. x (1878), t. 21b (*H. montanum*); Field, N.Z. Ferns, t. 28, f. 1 (*H. montanum*).
Hymenophyllum pulcherrimum, Col.—Hook. f. Fl. Nov. Zel. ii, t. 74; Hook. Sp. Fil. i, t. 37a; Field, N.Z. Ferns, t. 20, f. 6.
Hymenophyllum dilatatum, Swartz—Hook. & Grev. Ic. Fil. t. 60; Field, N.Z. Ferns, t. 15, f. 1.
Hymenophyllum demissum, Swartz—Field, N.Z. Ferns, t. 18, f. 1.
Hymenophyllum scabrum, A. Rich.—Fl. Nouv. Zel. t. 14, f. 1; Field, N.Z. Ferns, t. 17, f. 1.
Hymenophyllum flabellatum, Labill.—Pl. Nov. Holl. ii, t. 250; Field, N.Z. Ferns, t. 19, f. 6.
Hymenophyllum rufescens, T. Kirk—Trans. N.Z. Inst. xi (1879), t. 19A; Field, N.Z. Ferns, t. 15, f. 6.
Hymenophyllum ciliatum, Swartz—Hook. Sp. Fil. i, t. 31c (*H. Borgianum*).
Hymenophyllum subtilissimum, Kunze—Field, N.Z. Ferns, t. 15, f. 2.
Hymenophyllum Malingii, Metten.—Hook. Garden Ferns, t. 64 (*Trichomanes*); Field, N.Z. Ferns, t. 7, f. 2.
Hymenophyllum Cheesemanii, Bak.—Ic. Plant. t. 1132; Field, N.Z. Ferns, t. 5, f. 3.
Hymenophyllum Cheesemanii, var. *Armstrongii*, T. Kirk—Trans. N.Z. Inst. x (1878), App. 43, t. 21A (*H. Armstrongii*); Ic. Plant. t. 1614.
Hymenophyllum minimum, A. Rich.—Fl. Nouv. Zel. t. 14, f. 2; Field, N.Z. Ferns, t. 16, f. 5 (bad).
Hymenophyllum Tairāpitiense, Smith—Field, N.Z. Ferns, t. 14, f. 7.
Hymenophyllum unilateralis, Willd.—Field, N.Z. Ferns, t. 14, f. 8.
Hymenophyllum multifidum, Swartz—Hook. & Grev. Ic. Fil. t. 167; Field, N.Z. Ferns, t. 19, f. 8.
Hymenophyllum bicalce, Swartz—Hook. Sp. Fil. i, t. 35b; Field, N.Z. Ferns, t. 17, f. 3.
Trichomanes reniforme, Forst.—Hook. Exot. Ferns, t. 2; Hook. & Grev. Ic. Fil. t. 31; Field, N.Z. Ferns, t. 2, f. 3.
Trichomanes Lyallii, Hook. & Bak.—Ic. Plant. 1616; Field, N.Z. Ferns, t. 5, f. 4.
Trichomanes humile, Forst.—Hook. & Grev. Ic. Fil. t. 35; Field, N.Z. Ferns, t. 5, f. 8.
Trichomanes venosum, R. Br.—Hook. & Grev. Ic. Fil. t. 78; Field, N.Z. Ferns, t. 14, f. 4. and t. 18, f. 3 (*T. venustum*).
Trichomanes Colensoi, Hook. f.—Ic. Plant. t. 979; Field, N.Z. Ferns, t. 22, f. 3.
Trichomanes strictum, Menz.—Hook. & Grev. Ic. Fil. t. 122; Field, N.Z. Ferns, t. 28, f. 3 (*T. rigidum*, var. *strictum*).
Trichomanes elongatum, A. Cunn.—Ic. Plant. t. 701; Field, N.Z. Ferns, t. 16, f. 2 (*T. rigidum*, var. *elongatum*).
Lozsonia Cunninghamii, R. Br.—A. Cunn. Precur. t. 31; Hook. Gen. Fil. t. 15; Hook. Garden Ferns, t. 31; Field, N.Z. Ferns, t. 12, f. 1.
Cyathea dealbata, Swartz—A. Rich. Fl. Nouv. Zel. t. 10; Field, N.Z. Ferns, t. 10, f. 2; Phillips Turner, Rept. Waimarino Forest, p. 4.
Cyathea medullaris, Swartz—Field, N.Z. Ferns, t. 9, f. 3, and t. 29, f. 1 (young); Phillips Turner, Rept. Waimarino Forest, p. 2.
Cyathea Cunninghamii, Hook. f.—Ic. Plant. t. 985; Field, N.Z. Ferns, t. 9, f. 1, 2.
Hemitelia Smithii, Hook.—Hook. f. Fl. N.Z. ii, t. 72 (*Cyathea*); Buch. Trans. N.Z. Inst. xix (1887), t. 12, 13 (branched specimen); Field, N.Z. Ferns, t. 9, f. 4, 5; Phillips Turner, Rept. Waimarino Forest, p. 3.
Alsophila Colensoi, Hook. f.—Fl. Nov. Zel. ii, t. 73; Field, N.Z. Ferns, t. 3, f. 4.
Dicksonia squarrosa, Forst.—Field, N.Z. Ferns, t. 10, f. 6, and t. 25, f. 6 (juvenile); Phillips Turner, Rept. Waimarino Forest, p. 2.
Dicksonia fibrosa, Col.—Hook. Sp. Fil. i, t. 23b; Field, N.Z. Ferns, t. 10, f. 5, and t. 25, f. 1 (juvenile); Phillips Turner, Rept. Waimarino Forest, p. 3.
Dicksonia lanata, Col.—Hook. Sp. Fil. i, t. 23c; Field, N.Z. Ferns, t. 11 f. 1, 1A, 1B.
Davallia Tasmanii, Cheesem.—Field, N.Z. Ferns, t. 24, f. 5.
Davallia novae-zelandiae, Col.—Hook. Sp. Fil. i, t. 51b; Hook. Garden Ferns, t. 51; Field, N.Z. Ferns, t. 18, f. 5A.
Cystopteris fragilis, Bernh.—Hook. f. Fl. Tasm. ii, t. 166; Ic. Plant. t. 959 (*C. tasmanica*); Field, N.Z. Ferns, t. 18, f. 5A.
Lindsaya linearis, Swartz—Syn. Fil. t. 3; Field, N.Z. Ferns, t. 19, f. 4, 4A.
Lindsaya trichomanoides, Dryand.—Field, N.Z. Ferns, t. 19, f. 1.
Lindsaya trichomanoides, Dryand. var. *Lessonii*, Hook. f.—Bory. in Dup. Voy. Coq. Bot. t. 37, f. 2; Field, N.Z. Ferns, t. 19, f. 3.
Lindsaya viridis, Col.—Field, N.Z. Ferns, t. 19, f. 2.
Adiantum athiopium, Linn.—Hook. Sp. Fil. ii, t. 77c; Field, N.Z. Ferns, t. 17, f. 1.
Adiantum diaphanum, Blume—Hook. Sp. Fil. ii, t. 80c; Field, N.Z. Ferns, t. 13, f. 5.
Adiantum hispidulum, Swartz—Schkuhr Fil. t. 116 (*A. pubescens*); Field, N.Z. Ferns, t. 13, f. 1.
Adiantum formosum, R. Br.—Hook. Sp. Fil. ii, t. 86b; Field, N.Z. Ferns, t. 14, f. 6.
Adiantum affine, Willd.—Hook. Sp. Fil. ii, t. 86A (*A. Cunninghamii*); Field, N.Z. Ferns, t. 6, f. 1.
Adiantum fulvum, Raoul—Hook. Sp. Fil. ii, t. 85A; Field, N.Z. Ferns, t. 6, f. 4.
Hypolepis tenuifolia, Bernh.—Hook. Sp. Fil. ii, t. 89c, 90A; Field, N.Z. Ferns, t. 24, f. 3.
Hypolepis millefolium, Hook.—Sp. Fil. ii, t. 95b; Field, N.Z. Ferns, t. 3, f. 2.

- Hypolepis distans*, Hook.—Sp. Fil. ii, t. 95c; Field, N.Z. Ferns, t. 28, f. 6.
Cheilanthes tenuifolia, Swartz.—Hook. Sp. Fil. ii, t. 87c; Field, N.Z. Ferns, t. 28, f. 2.
Cheilanthes Sieberi, Kunze.—Hook. Sp. Fil. ii, t. 97b; Field, N.Z. Ferns, t. 21, f. 1.
Pellaea falcata, Fee.—Hook. Sp. Fil. ii, t. 111b; Ic. Plant. t. 207 (*P. seticaulis*); Field, N.Z. Ferns, t. 18, f. 4.
Pellaea rotundifolia, Hook.—Fil. Exot. t. 48; Ic. Plant. t. 422 (*Pteris*); Field, N.Z. Ferns, t. 14, f. 2.
Pteris aquilina, Linn. var. *exculenta*, Hook. f.—Hook. Sp. Fil. ii, t. 141; Field, N.Z. Ferns, t. 14, f. 1, 1A.
Pteris scaberula, A. Rich.—Fl. Nouv. Zel. t. 11; Hook. Sp. Fil. ii, t. 93A; Field, N.Z. Ferns, t. 19, f. 5.
Pteris tremula, R. Br.—Hook. Sp. Fil. ii, t. 120b; Field, N.Z. Ferns, t. 23, f. 2.
Pteris comans, Forst.—Ic. Plant. t. 973 (*P. Endlicheriana*); Field, N.Z. Ferns, t. 24, f. 1.
Pteris macilenta, A. Rich.—Fl. Nouv. Zel. t. 11; Field, N.Z. Ferns, t. 7, f. 1.
Pteris incisa, Thunb.—Labill. Pl. Nov. Holl. ii, t. 245 (*P. vespertilionis*); Field, N.Z. Ferns, t. 8, f. 4.
Lomaria Patersoni, Spreng. var. *elongata*, Hook. & Bak.—Hook. Sp. Fil. iii, t. 143 (*L. elongata*); Ic. Plant. t. 627, 628 (*L. Colensoi*); Field, N.Z. Ferns, t. 11, f. 3, 3A, 3B.
Lomaria discolor, Willd.—Field, N.Z. Ferns, t. 4, f. 2, 2A.
Lomaria vulcanica, Blume.—Hook. Ic. Plant. t. 969; Field, N.Z. Ferns, t. 27, f. 5, 5A.
Lomaria lanceolata, Spreng.—Ic. Plant. 429; Field, N.Z. Ferns, t. 11, f. 2, 2A, and t. 7, 7A (*L. aggregata*).
Lomaria dura, Moore.—Field, N.Z. Ferns, t. 10, f. 4, 4A.
Lomaria Banksii, Hook. f.—Fl. Nov. Zel. ii, t. 76; Field, N.Z. Ferns, t. 26, f. 2.
Lomaria alpina, Spreng.—Hook. f. Fil. Exot. t. 32; Fl. Antarct. ii, t. 150; Raoul, Choix. t. 2A (*L. pumila*); Field, N.Z. Ferns, t. 17, f. 5, 5A.
Lomaria capensis, Willd.—Ic. Plant. t. 427, 428 (*L. procera*); Hook. Garden Ferns, t. 53 (*L. procera*); Homb. & Jacq. Voy. au Pole Sud, Crypt. t. 2, f. E, E' (*L. procera*); A. Rich. Fl. Nouv. Zel. t. 13 (*Stegania procera*); Field, N.Z. Ferns, t. 2, f. 1, 1A.
Lomaria capensis, Willd. var. *minor*, Hook. f.—Fl. Nov. Zel. ii, t. 75 (*L. procera*, var. *minor*); Field, N.Z. Ferns, t. 12, f. 4, 4A, 4B (*L. procera*, var. *minor*).
Lomaria filiformis, A. Cunn.—Hook. Sp. Fil. iii, t. 149; Field, N.Z. Ferns, t. 10, f. 3, 3A, 3B; Cockayne, N.Z. Pl. t. 10.
Lomaria nigra, Col.—Ic. Plant. t. 960; Field, N.Z. Ferns, t. 26, f. 3, 3A.
Lomaria fluviatilis, Spreng.—Raoul, Choix. t. 2A (*L. rotundifolia*); Field, N.Z. Ferns, t. 27, f. 2, 2A.
Lomaria membranacea, Col.—Hook. Sp. Fil. iii, t. 145; Field, N.Z. Ferns, t. 5, f. 6, 6A.
Lomaria Fraseri, A. Cunn.—Hook. Ic. Plant. t. 185; Field, N.Z. Ferns, t. 24, f. 4, 4A.
Doodia media, R. Br.—Field, N.Z. Ferns, t. 20, f. 1.
Doodia caudata, R. Br.—Field, N.Z. Ferns, t. 20, f. 4, 4A.
Asplenium flabellifolium, Cav.—Hook. Exot. Fil. t. 208; Field, N.Z. Ferns, t. 6, f. 6.
Asplenium Trichomanes, Linn.—Field, N.Z. Ferns, t. 28, f. 8.
Asplenium falcatum, Lam.—Field, N.Z. Ferns, t. 21, f. 5.
Asplenium obtusatum, Forst.—Homb. & Jacq. Voy. au Pole Sud, Crypt. t. 1, f. B; Field, N.Z. Ferns, t. 23, f. 3.
Asplenium lucidum, Forst.—Field, N.Z. Ferns, t. 13, f. 6.
Asplenium lucidum, Forst. var. *obliquum*, Moore—Homb. & Jacq. Voy. au Pole Sud, Crypt. t. 1A (*A. apice-dentatum*).
Asplenium lucidum, Forst. var. *scleroprium*, Moore—Homb. & Jacq. Voy. au Pole Sud, Crypt. t. 1b (*A. scleroprium*).
Asplenium lucidum, Forst. var. *Lyallii*, Hook. f.—Fl. Nov. Zel. ii, t. 77.
Asplenium Hookerianum, Col.—Raoul, Choix. t. 1 (*A. adiantoides*); Ic. Plant. t. 983 (*A. adiantoides*, var. *minus*); Field, N.Z. Ferns, t. 16, f. 4.
Asplenium Hookerianum, var. *Colensoi*, Moore.—Ic. Plant. t. 984 (*A. adiantoides*, var. *Colensoi*).
Asplenium bulbiferum, Forst.—Hook. Ic. Plant. t. 423; Homb. & Jacq. Voy. au Pole Sud, Crypt. t. 3, f. 1; Field, N.Z. Ferns, t. 6, f. 5.
Asplenium bulbiferum, Forst. var. *laxum*, Hook. f.—Homb. & Jacq. Voy. au Pole Sud, Crypt. t. 3, f. J (*A. laxum*).
Asplenium bulbiferum, Forst. var. *tripinnatum*, Hook. f.—Homb. & Jacq. Voy. au Pole Sud, Crypt. t. 3, bis (*A. tremulum*); Field, N.Z. Ferns, t. 23, f. 6.
Asplenium Richardi, Hook. f.—Ic. Plant. t. 977 (*A. adiantoides*, var. *Richardi*); Field, N.Z. Ferns, t. 28, f. 5.
Asplenium flaccidum, Forst.—Field, N.Z. Ferns, t. 12, f. 2.
Asplenium umbrosum, J. Sm.—Ic. Plant. t. 978 (*A. Brownii*); Field, N.Z. Ferns, t. 5, f. 2.
Asplenium japonicum, Thunb.—Brack. Fil. U.S. Expl. Exped. t. 18 (*Diplazium congruum*).
Aspidium aculeatum, Swartz, var. *vestitum*, Hook. f.—Homb. & Jacq. Voy. au Pole Sud, Crypt. t. 4, f. 8 (*Polystichum vestitum*), and t. 5, f. N (*P. venustum*); Field, N.Z. Ferns, t. 8, f. 2; Cockayne, N.Z. Pl. t. 19 (*Polystichum vestitum*).
Aspidium aculeatum, Swartz, var. *sylvaticum*—Hook. f. Fl. Nov. Zel. ii, t. 81 (*Polypodium sylvaticum*).
Aspidium mohrioides, Bory.—Dup. Voy. Coq. Bot. Crypt. t. 35; Hook. f. Fl. Antarct. ii, t. 149.
Aspidium Richardi, Hook.—Sp. Fil. iv, t. 222; Hook. f. Fl. Nov. Zel. ii, t. 78 (*Polystichum aristatum*).
Field, N.Z. Ferns, t. 13, f. 4.

- Aspidium oculatum*, Hook.—Sp. Fil. iv, t. 228.
Aspidium cystostegia, Hook.—Sp. Fil. iv, t. 227; Field, N.Z. Ferns, t. 8, f. 3.
Aspidium capense, Willd.—Field, N.Z. Ferns, t. 6, f. 2.
Nephrodium Thelypteris, Desv. var. *squamulosum*, Schlecht.—Fil. Cap. t. 11; Field, N.Z. Ferns, t. 13, f. 3.
Nephrodium d-compositum, R. Br.—Hook. f. Fl. Nov. Zel. ii, t. 79; Field, N.Z. Ferns, t. 5, f. 7.
Nephrodium glabellum, A. Cunn.—Field, N.Z. Ferns, t. 6, f. 3.
Nephrodium velutinum, Hook. f.—Fl. Nov. Zel. ii, t. 80; Field, N.Z. Ferns, t. 20, f. 2.
Nephrodium setigerum, Bak.—Hook. Sp. Fil. iv, t. 269 (*Nephrodium tenericaule*).
Nephrodium hispidum, Hook.—Field, N.Z. Ferns, t. 3, f. 3.
Nephrodium unitum, R. Br.—Field, N.Z. Ferns, t. 23, f. 1.
Nephrodium molle, Desv.—Field, N.Z. Ferns, t. 23, f. 5.
Nephrolepis cordifolia, Presl.—Field, N.Z. Ferns, t. 20, f. 3.
Polypodium punctatum, Thunb.—Labill. Pl. Nov. Holl. ii, t. 211 (*P. rugulosum*); Field, N.Z. Ferns, t. 15, f. 3.
Polypodium pennigerum, Forst.—Field, N.Z. Ferns, t. 25, f. 3, and t. 26, f. 4.
Polypodium australe, Mett.—Homb. & Jacq. Voy. au Pole Sud. Crypt. t. 2, f. G (*Grammitis*), and t. 2, f. F, II (*Grammitis rigida* and *G. humilis*); Field, N.Z. Ferns, t. 22, f. 1, and t. 15, f. 1 (*P. pumilum*).
Polypodium graminifolium, R. Br.—Labill. Pl. Nov. Holl. ii, t. 239 (*G. heterophylla*); Field, N.Z. Ferns, t. 14, f. 3.
Polypodium tenellum, Forst.—Hook. f. Fl. Nov. Zel. ii, t. 82 (*Arthropteris tenella*); Field, N.Z. Ferns, t. 4, f. 4.
Polypodium serpens, Forst.—Hook. & Grev. Ic. Fil. t. 93 (*Niphobolus rupestris*), and t. 44 (*Niphobolus bicolor*); Field, N.Z. Ferns, t. 5, f. 9.
Polypodium Dictyopteris, Mett.—Ic. Plant. t. 409 (*P. attenuatum*); Field, N.Z. Ferns, t. 15, f. 5 (*P. Cunninghamii*).
Polypodium pustulatum, Forst.—Field, N.Z. Ferns, t. 17, f. 2.
Polypodium Billardieri, R. Br.—Field, N.Z. Ferns, t. 2, f. 4.
Polypodium novae-zelandiae, Bak.—Ic. Plant. t. 1674; Field, N.Z. Ferns, t. 27, f. 3.
Nothochloa distans, R. Br.—Ic. Plant. t. 900; Field, N.Z. Ferns, t. 16, f. 3.
Gymnogramme rutefolia, Hook. & Grev.—Ic. Fil. t. 90; Hook. Fil. Exot. t. 5; Field, N.Z. Ferns, t. 10, f. 1 (*G. Pozoi*, var. *rutefolia*).
Gymnogramme leptophylla, Desv.—Hook. & Grev. Ic. Fil. t. 25; Field, N.Z. Ferns, t. 16, f. 6.
Gleichenia circinata, Swartz—Labill. Sert. Nov. Cal. t. 11 (*G. semivestita*); Hook. Sp. Fil. i, t. 2A (*G. semivestita*); Field, N.Z. Ferns, t. 2, f. 2.
Gleichenia dicarpa, R. Br. var. *heciostophylla*, Hook. f.—Hook. Sp. Fil. i, t. 2B (*G. heciostophylla*); Field, N.Z. Ferns, t. 3, f. 1 (*G. dicarpa*).
Gleichenia dicarpa, R. Br. var. *alpina*, Hook. f.—Hook. & Grev. Ic. Fil. t. 58; Cockayne, Rept. Bot. Stew. Is. t. 36.
Gleichenia Cunninghamii, Heward.—Hook. Sp. Fil. i, t. 6B; Hook. f. Fl. Nov. Zel. ii, t. 71; Field, N.Z. Ferns, t. 7, f. 3; Cockayne, N.Z. Pl. t. 66.
Gleichenia flabellata, R. Br.—Hook. Fil. Exot. t. 71; Field, N.Z. Ferns, t. 8, f. 1.
Gleichenia dichotoma, Hook.—Field, N.Z. Ferns, t. 4, f. 1.
Schizaea fistulosa, Labill.—Pl. Nov. Holl. ii, t. 250; Field, N.Z. Ferns, t. 14, f. 5.
Schizaea fistulosa, Labill. var. *australis*, Hook. f.—Homb. & Jacq. Voy. au Pole Sud. Crypt. t. 4, f. 2 (*S. palmata*).
Schizaea bifida, Swartz—Field, N.Z. Ferns, t. 12, f. 3.
Schizaea dichotoma, Swartz—Hook. & Grev. Ic. Fil. t. 17; Field, N.Z. Ferns, t. 24, f. 2.
Lygodium articulatum, A. Rich.—Fl. Nouv. Zel. t. 15; Field, N.Z. Ferns, t. 22, f. 4.
Todea barbara, Moore—Bot. Mag. t. 5954; Hook. f. Fl. Tasm. ii, t. 178 (*T. africana*); Field, N.Z. Ferns, t. 26, f. 1.
Todea hymenophylloides, A. Rich.—Fl. Nouv. Zel. t. 16; Hook. Garden Ferns, t. 46B; Ic. Plant. t. 8 (*T. pellucida*); Field, N.Z. Ferns, t. 4, f. 3.
Todea superba, Col.—Ic. Plant. t. 910 (*Leptopteris*); Field, N.Z. Ferns, t. 21, f. 4; Gard. Chron. 1895, i, t. 107 (good); Phillips Turner, Rept. Waimarino Forest. p. 6.
Marattia fraxinea, Sm.—Ic. Ined. t. 48; Field, N.Z. Ferns, t. 25, f. 5; Buch. Trans. N.Z. Inst. viii (1876), t. 18 (structure of rhizome).
Ophioglossum lusitanicum, Linn.—Field, N.Z. Ferns, t. 21, f. 7.
Ophioglossum vulgatum, Linn.—Field, N.Z. Ferns, t. 24, f. 6.
Botrychium lunaria, Swartz—Field, N.Z. Ferns, t. 21, f. 8.
Botrychium ternatum, Swartz—Field, N.Z. Ferns, t. 20, f. 5, 5A.
Botrychium ternatum, Swartz, var. *dissectum*, Hook. f.—Field, N.Z. Ferns, t. 13, f. 2, 2A.

MARSILEACEÆ.

- Pilularia novae-zelandiae*, T. Kirk—Trans. N.Z. Inst. ix (1877), t. 29.

LYCOPODIACEÆ.

Phylloglossum Drummondii, Kunze—Ic. Plant. t. 908.

Lycopodium Selago, Linn.—Hook. f. Fl. Tasm. ii, t. 170A.

Lycopodium varium, R. Br.—Hook. & Grev. Ic. Fil. t. 112 ; Hook. f. Fl. Tasm. ii, t. 170B.

Lycopodium Billardieri, Spring. var. *gracile*, T. Kirk—Trans. N.Z. Inst. xvi (1884), t. 29 (*C. varium*, var. *gracile*).

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Lycopodium volubile, Forst.—Hook. & Grev. Ic. Fil. t. 170.

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ISOETACEÆ.

Isoetes Kirkii, A. Braun—T. Kirk, Trans. N.Z. Inst. ii (1870), t. 7.

Isoetes alpinus, T. Kirk—Trans. N.Z. Inst. vii (1875), t. 25.

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8. *Drimys Traversii*, T. Kirk.

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